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GEORGICAL  
ESSAYS.

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ESSAYS

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ESSAYS AND MUSEUM

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VOLUME VI

1808

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GEORGICAL  
ESSAYS:

BY

A. HUNTER, M. D. F. R. S. L. & E.

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NISI UTILE EST QUOD FACIMUS STULTA EST GLORIA. *Phaed.*

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## GEORGICAL ESSAYS.

### ESSAY I.

#### *On the Principles of Vegetation.*

THE subject of this inquiry has been an object of pursuit in every age, and of every civilized country in the world: not uniformly, and uninterrupted, indeed, but in proportion to the peace and tranquillity of respective states and times. Rome, once the mistress of the world, did not shine more in the arts of government and civil polity, than in the cultivation of her lands; and we find the same patriotic statesmen, who rendered themselves immortal by their unremitting efforts to support and maintain liberty, were not less eminent for their patriotic ardour to promote and encourage the beneficial culture of its soil.

Intestine commotions and civil broils are

ever unfriendly to science and the arts, but to none more so than to agriculture ; for when the occupier's tenure is rendered precarious by civil disorder, he has little inclination and less encouragement to attempt improvement ; and still less to plough and sow, it being uncertain who may reap, indeed whether there will be any thing to reap ; it having too commonly happened, that whole countries have been ravaged and become desolate by the desperate frenzy of hostile and bloody contenders, who too frequently are deaf and blind to the remonstrances of humanity.

It is certainly clear, from the average prices of corn and provisions of all kinds for twenty years past, that there is not too much land in cultivation. Prices have been considerably above what has been deemed, and that justly too, the medium standard. As a manufacturing and commercial country, it is properly the duty of the legislature to provide, as far as consistently may be with the liberty of the subject, that the price of provisions may be kept as nearly as possible to their medium value. This is conceived to be very practicable, even so as to be a convenience to the grower as well as the consumer.

Some writers of great abilities\* have supposed, that the advance of commodities in price, is rather apparent and nominal, than real. Things are not so much, if at all, advanced in price, say they, as is imagined; the precious metals are exceedingly increased in quantity, and proportionably fallen in value. Possibly there may be some truth in this observation, if we go back some hundred years, and if taken upon a scale that comprehends all Europe; but for the term of twenty or fifty, or even from the time Mr. Locke wrote to the present hour, there is little difference in the value of silver or gold; an ounce of either being of much the same value now as then. The frequent and sudden changes that take place in the price of corn and other commodities, which sometimes are at double the price one year they were the foregoing, must be owing to some other cause than that above-mentioned, which operates slowly, if at all, and is not perceptible in less time than a century.

If the quantity of corn and provisions at

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\* Mr. Locke, Baron Montesquieu, &c.

market always bore the same proportion to the demand there is for them, the price would be always invariably and unchangably the same. The variation of prices, therefore, is governed by the variation of the said proportion. If the demand be greater, and the quantity the same, or the demand the same, and the quantity less, the price must necessarily advance : and *vice versa*, if the quantity should increase, and the demand continue the same, the price must as necessarily fall ; and it is not in the power of man to make it otherwise. But though this immutable relation is beyond our power to alter, we can by art and industry increase the quantity, and thereby lower the price ; cheapness being the infallible consequence of plenty, which is the direct object and effect of an improving cultivation. This is a matter of great consequence to the poor labourer, the manufacturer, and merchant ; and no disadvantage to the grower ; because what he would lose by the fall of price, he would gain with interest by an increase of quantity.

It is not easy to conceive how many and how great the improvements are, which have been made in this most important of all arts,

in the course of the present century. A patriotic spirit of uncommon ardour hath gone forth; and our nobility and gentry, like the Senators of Rome, have set, as it were, their hands to the plough, and exited their tenants and neighbours to practices of which they had no idea before. They have done more; they have instituted societies, and made them the receptacles and distributors of useful knowledge; they have raised subscriptions, and added marks of honour, and pecuniary advantages, to the rewards which naturally result from the attention and industry of the ingenious artist. Surely the greatest respect is due to the members of all those institutions, whose motives are—public good and universal usefulness.

But it must be allowed, that, although much has been done, there still remains much more to do. Experimenters have not always (perhaps but seldom) entered into the views, and ably seconded the intentions of those valuable institutions. Animated with the hope of obtaining the premiums held out, by dint of extraordinary exertions, expensive manures, and a concurrence of fortunate circumstances, more the effect of chance than of design, they

often have been the successful adventurers, though at the same time entirely ignorant to what cause they owed their success. We too often indeed ascribe effects to causes which are no way connected with them. The practice of such men is more like the nostrums of quacks, than the recipes of a regular physician. The medicine may be good, but being ignorant of principles, they know not how to accommodate it, as different circumstances may require.

How vegetation may be carried to the greatest degree of perfection, by means easily practicable, and at the same time the most advantageous to the husbandman, is one of the most important inquiries that the human understanding can be employed in the pursuit of. Some ingenious men, however, have made the following the previous question; "What is that substance, matter, or thing, which is the true and only proper food of plants—which enters into the vessels appointed by nature to receive it, is assimilated by, and becomes constituent parts of them, augmenting their magnitude, extension, and weight, from an almost imperceptible atom to the weight of

many tons, and to a body of inconceivable dimensions?"

This question seems much more curious than useful, and is perhaps of very little consequence to the husbandman. The philosopher may amuse himself by inquiring after first principles, and the elementary parts of bodies, but the farmer should never be diverted from a profitable practice, until one more so is recommended by the success of repeated experiments.

Various are the opinions of the learned concerning this matter. Some suppose the food of plants to be water; some earth; others air, nitrous salts, oil, &c. &c. perhaps all of them wide enough of the mark. It must be confessed, we know nothing of the essence of things. We are not endued with faculties equal to the curious research. Things are known to us by their properties only. But what are their properties by which they are known to us, but certain powers to affect us in a particular manner, and to impress different sensations and perceptions on our bodily organs? These different perceptions, indeed, enable us to distinguish, accurately enough,

one thing from another; but we are totally ignorant of the nature of those powers, and equally so of the essence or substratum in which they inhere, and by which they are supported.

The great system of the universe is governed by general laws; which, so far as our knowledge extends, obtain universally. Gravitation, attraction, repulsion, cohesion, and perhaps many other principles, affect every portion of matter that comes within our knowledge; but what supports those powers, in what their energy consists, or from whence they are derived, we are by no means able to apprehend or conceive. Vegetation also obtains universally on this globe. Wherever there is earth, vegetation takes place; therefore the principle (or principles) of vegetation, whatsoever it be, or in whatsoever it consists, must be universal; and all that is necessary for the husbandman to do, is to prepare his ground effectually, put in his seed or plants at the proper season, and vegetation will most assuredly follow. Indeed, so prolific is nature, as to clothe the face of the globe with herbs and plants in every region, without the intervention or assistance of man. The fund

or magazine, then, which furnishes the pabulum or food of plants, is established and supplied by the economy of nature, seeing it obtains at all times and every where, unassisted by art. But how and in what manner nature is to be assisted, how and by what means vegetation is to be promoted, and carried to its utmost and most beneficial degree of perfection, is the grand *desideratum*, the great and important object, of our inquiry.

Experiments or observations made on occurrences which happen in the course of things, are the ground-work of all certainty in this matter. Theories, not built upon and supported by experiments, are matters of mere amusement, and have no existence but in the imagination. Unfortunately, experiments have been published by the thousand, which bear the clearest internal evidence of their never having been made but upon paper. Such writers should be regarded as the sharks of society, who would sacrifice truth, mislead mankind, and impose upon the public, to pocket a little money. But to proceed with our inquiry.

The principles of vegetation, and the means

by which it may be promoted in the most successful and beneficial manner, may be fitly divided into three general heads, and distinguished by the terms *mechanical*, *chemical*, and *nutritive*. The *mechanical* includes every operation which tends to break, divide, and pulverise the soil; whether it be by ploughing and harrowing, digging and hoeing, or by any other means whatever; that being the most eligible which most effectually performs the operation at the least expense.

Pulverizing the soil may be truly considered as the first step towards an improving vegetation; not as *producing* the food or nourishment of plants, but of putting the soil into a fit condition for *receiving* it, from whatever source it may be derived, and giving easy access to the roots and fibres which extend themselves every way in quest of the same.

*Chemical* principles produce much the same effects, but in a way we cannot so easily, nor so perfectly, comprehend. The mechanical powers are subservient to our wills, and we can continue the use of them until the desired end is obtained; but the effects of chemical operations are not so certain in this business,

as a certain concurrence of circumstances, not always in our power to procure, is necessary to produce the hoped-for success. Much depends upon the temperature of the seasons, the state of the air, and many other things not in the power of man to foresee or to govern. Fermentation seems to be the principle agent in promoting vegetation by chemical powers. This divides, attenuates, and subtilizes, by means of an internal motion of the parts, which we cannot clearly conceive. Probably it is on this principle that marl, chalk, shells, and every kind of calcareous earth, are fertilizers of land. Not by any matter or substance inherent in them, as constituent parts of the same ; but as absorbent bodies, which attract much more powerfully the principles of vegetation than earth alone could do.

We come next to inquire concerning nutritive principles. And here we have a field to range in, as capacious, at least, as the earth we inhabit, together with its atmosphere ; perhaps much more, even not less than the solar system, as that immense body of fire, which is the centre thereof, gives life and energy to the whole creation ; and annually revives, reanimates, and bestows as it were rejuvines-

gency on the whole animal and vegetable world.

But before we proceed on this inquiry, it may be proper to make a few observations, the truth of which is self-evident, and consonant to the common sense of mankind. By common sense, the writer does not mean common *opinion*; for nothing is more vague and liable to error than that; but those ideas which are the same in all men, as proceeding from identical or similar sensations and perceptions involuntarily impressed upon them. This is the true and only defensible meaning of the term common sense, though it is frequently made to stand for, and express, principles which are supposed to be innate in the mind, but in fact have nothing common or identical in them, but are as infinitely diversified in different men as are their features.

There seems to be a natural relation, connexion, and dependence, between the animal and vegetable kingdoms. No part of the teraqueous globe that we know of, that is occupied by living creatures of any kind, but is replete with vegetables proper for their sustenance and support; and it is equally certain,

that wherever vegetables grow and flourish, it is stocked with animals in proportion thereto.

It is sufficiently obvious, that the animal kingdom is maintained and supported by the vegetable ; for though carnivorous animals eat little or no vegetable food, yet they live upon those which are entirely supported by it ; for they never eat each other, unless in cases of famine or great distress. It is very possible the vegetable kingdom may no less depend upon the animal for its sustenance and support, than the animal doth upon it ; and if the writer is not much mistaken, pretty clear and strong evidence may be had, that this is really the case ; so that they reciprocally subsist on and are supported by each other.

It is not many years since that a surprising discovery was made by that very celebrated investigator of nature, Dr. Priestley, who clearly proved by experiment, that common air, when become feculent and putrid by animal respiration and perspiration, so as to be unfit for the common purposes of life, is readily purified and made wholesome by the vegetable kingdom, which imbibes and absorbs those putrid steams that are so deadly noxious to animal life. But

what is most surprising, instead of growing sickly in so impure an air as he expected, he found the plants were invigorated, and their growth promoted thereby; so that they were more fresh, green, and healthy, than those which grew in common wholesome respirable air.

This wonderful economy of nature, loudly proclaims the wisdom and goodness of Providence; for how great soever might be the fund of common air necessary to the purposes of life, such is its continual waste and consumption, that the whole stock must soon have been exhausted, and animal life become extinct, if no provision had been made to purify and render wholesome the original stock, as daily use might require.

But not to insist on a particular instance which may be thought too curious to establish a general principle upon, let us inquire how far this doctrine may be supported by the concurring testimony of all mankind, in which there is not a possibility of deception; for if those facts which are agreeable to and supported by the common sense of mankind, cannot be depended upon for certain infallible

truths, then there is no such thing as certainty attainable by human nature. Is it possible to doubt, if that glorious luminary the sun, which dispenses heat, and light, and life, to this lower world, hath any real existence, and is the cause of those sensations? Surely it is not; and yet in what does this certainty consist, but the common sense of mankind? I see, feel, perceive, and am affected in a particular manner by the appearance of this fountain of life; all mankind are imprest with identical or similar sensations, perceptions, and affections; therefore no man doubts, or can possibly doubt, of the certainty and reality of the sun's existence.

All truths which are derived from common sense, are equally certain with the above; for if it were possible that all men could be deceived in any of those sensations, perceptions, and affections, which are common to all men; that is, if they could see, feel, and be affected in any way or manner they could not see, feel, and be affected, then truth and certainty, to the human mind, would be an impossible thing; there being no criteria by which truth might be distinguished from falsehood, nor man in-

dued with faculties to perceive and mark the difference of things.

Those things then which are felt, perceived, and produce the same sensations and affections in all men, and every where, may be depended upon as truths infallibly certain, beyond a possibility of deception. Not so experiments made by the most careful and the most candid, till they have been repeated again and again; and the first trial confirmed and duly authenticated by subsequent ones. Much more is to be feared from the cunning, the artifice, the prepossession, the prejudice, the vanity, and the interest of designing men, who too frequently have been found to warp and bend their accounts, to promote their interested views.

It is in the observation of every man, from the illiterate occupier of a cottage to the first gardener of a prince, that all kinds of animal substances, when thoroughly digested and corrupted, are the strongest and most powerful promoters of vegetation. The hair, the skin, the horns and hoofs, the urine and excrements, the flesh, blood, sinews, and even the bones, are all richly replete with matter which

supports and invigorates vegetation universally. It is therefore undeniably certain, that animal substances contain those principles which are the real and genuine food of plants. It is absurd, therefore, to suppose their food is earth, or water, or air, fire, or heat, or any one simple element or thing whatever. It seems clearly evident, that it is a combination of principles derived from animal substances by the chemistry of nature. When animal substance has been thoroughly putrified, almost the whole becomes volatile, and is so far attenuated, subtilized, and refined, as to be rendered capable of entering the roots and fibres of the minutest plants.

It seems then, that as the animal kingdom is entirely supported by the vegetable, so is the vegetable by the animal; and each is reciprocally the support of, and is supported by the other. The matter of each is essentially the same; each is indued with the principles of life and augmentation, though appearing under very different forms; each mutually transmutable into the other by the mere unassisted operations of nature,

Hence it seems to appear, that the wisdom

and goodness of Providence have established the means of supporting and upholding the present system of the universe, till time shall be no more, by constant, uniform, uninterrupted powers or laws, which act unceasingly for the mutual conservation of the whole. Every atom of matter, whether animal or vegetable, seems to teem with life, yet contains within itself the seeds of corruption and decay. In that state it enters into a new system of organization, and becomes the principle of regeneration and rejuvenescence, which annually returns at the appointed seasons, when all appears charming, sprightly, and gay.

To this theory it may be objected, that vegetation may be successfully promoted by vegetable manures, without the least assistance from animal substance of any kind. Every one knows that it is common to manure the ground by ploughing in green vegetables, such as buck or French wheat, clover, vetches, &c. which often succeed well without any other help whatever. This objection falls short of its object; it only proves, that profitable crops may be obtained without the cultivator's using animal substances under that form: but the theory supposes, that every

vegetable is replete with principles derived from animal substances, and only differs from them in being more subtilized and refined.

It is equally certain, that vegetation may be powerfully promoted, without laying on or providing any manure at all. The new or horse-hoeing husbandry depends entirely upon reducing and pulverizing the soil. It cannot be reasonably supposed, however, that the spade and hoe, or plough and harrow, convey any fertilizing principles. These operations, which are found to render our lands so surprisingly fertile when judiciously performed, only prepare the soil for the easy entrance of those fertilizing principles, with which the atmosphere is abundantly replete. The atmosphere is the grand magazine, the great receptacle of putrid exhalations, which incessantly fly off from all animal substances, the living as well as dead; and by their specific levity mount up into the air, from whence being condensed, they return in dews, rain, snow, &c. and impregnate the soil as deep as it hath been duly pulverized.

It seems very evident then, that whether the husbandman manure his field from the dung-heap, or by ploughing in green vege-

tables, or by duly exposing it to the unceasing influence of the atmosphere ; the principles of vegetation, which he bestows in either case, are essentially and substantially the same. They all equally originate from putrid animal substances. That from the dung-heap is indeed by far the strongest, it having not gone through its last stage of digestion and putrefaction ; in this gross and impure state, it sometimes poisons and kills, and thereby defeats its intended purpose. It in general, however, when discreetly used, gives great luxuriance, and an enlarged size to the stalks and blades ; but luxuriance is not fruitfulness ; indeed they are seldom, if ever, compatible. This holds good in all kinds of grain as well as fruits. Manure imperfectly digested, or used in too great abundance, often defeats the views and hopes of the farmer : he may reap a great burden of straw and very little corn. The same thing may happen from green vegetable manure, unless it be ploughed in time enough to undergo a thorough fermentation, and at the last ploughing be intimately blended with the soil. But of this there is no danger in the last-mentioned method of cultivation ; for the principles of vegetation derived from the atmosphere, by thoroughly pulverizing the soil, are so perfectly digested,

subtilized, and refined from the impurities of the former, that unhealthiness or a surfeit is not to be apprehended ; especially as it is not given all at once like the former, but administered from time to time as the skilful husbandman may see necessary.

I shall now proceed to consider of the easiest and most effectual means of promoting vegetation, in support of, and consistent with the above principles,

I have thus attempted to show that there is a natural relation or connexion between the animal and vegetable kingdoms. That as the animal kingdom lives on, and is wholly subsisted by, the vegetable ; so is the vegetable no less maintained and supported by the animal. Each by turns being mutually the support of and supported by the other.

If this theory be just, animal substance, from whatever subject it is derived, or under whatever form it may appear, when it is perfectly digested and putrified, subtilized, and become volatile, is the true, genuine, and sole aliment of plants. The dunghill, which consists chiefly of animal excrements, contains the greatest quantity of nutritive principles of any

substance whatever of equal dimensions, the constituent parts of animals only excepted. The dunghill, therefore, is the greatest and most powerful fertilizer of land; and could the farmer acquire as much of it, upon moderate terms, as he chose, he might soon make his land as fertile as the climate would admit, or he could desire. But in most situations, the quantity to be got, as every one knows, bears a very small proportion, indeed, to the quantity wanted.

As a substitute and succedaneum to the dung-heap, ploughing in green vegetables has been adopted with success. This practice is a kind of improved fallowing: for though the land be cropped, its produce at a proper season is ploughed in, and no present profit is derived from it. The land therefore may be properly said to be under fallow, until by future culture it is in fit condition to receive the seed of a future crop.

But the more general practice is, when the land has been exhausted by having been too frequently cropped, and is become foul and full of weeds, to give it a year's fallow; or sometimes two winters and a summer's fallow, which is often necessary to eradicate the weeds,

thoroughly pulverize the soil, and render it sufficiently fertile to bear a crop of wheat. But when a man enters upon a farm that has been racked out by the former tenant, and the whole of it left in the sad condition above represented, to give it a year's fallow, without receiving any beneficial return, would to most prove a severe trial both to their patience and their pockets.

Mr. Tull, to whose memory the most grateful tribute of respect is due, has in a great variety of instances shown to what an amazing degree of fertility even very poor land may be brought by repeated and frequent breaking, dividing, and pulverizing the soil. The truth and propriety of his principles are generally allowed, and indeed cannot be well controverted, how much soever the mode he adopted, and his method of applying them, may be decried by some, and, by the peculiar circumstances of the land of others, rendered impracticable. The soil of his estate was in general light and fragile, and, in all respects, peculiarly suitable to his mode of practice. All land, whatever may be its temperature, may be fertilized and improved by frequent ploughing and harrowing, if they are well timed; but

all land is not equally suitable to the drill and horse-hoeing culture ; and some, though, perhaps, comparatively little, not at all so. Hilly countries, land that is rocky, or abounding with large loose stones, or that consists of a strong, moist, adhesive clay, is not, in general, suitable to the drill culture ; but the land that is not suitable, I apprehend, bears no great proportion to that which is. The intelligent husbandman, who is convinced of the truth of the principles, will readily vary the application of them as circumstances may require.

When land is exhausted, quite out of tilth, and overrun with the strongest and most noxious weeds, it is absolutely necessary to eradicate them, to clean and pulverize the soil ; otherwise the seed, whatever it may be, might as well be thrown on the highway, as sown in land in that condition. It is a question of great importance, how and by what means land may be fertilized and its vigour restored, the weeds displaced and destroyed, consistently with the beneficial culture of a profitable crop growing on the same field at the same time. It will readily occur to the reader, that this is not possible to be done in any mode of culture but that of plant-

ing in drills, and pulverizing the soil by ploughing and horse-hoeing the intervals during the growth of the crop through the whole summer. Mr. Tull rightly advised well-timed ploughing and harrowing, till the land was thoroughly pulverized and well cleaned of weeds; for the grain and plants, which were chiefly the subjects of his culture, would, by no means, admit of being sown in an exhausted soil, overrun with weeds, with the least prospect of a crop, though it may be ever so certain that the growth of the several articles he cultivated, was promoted in the most beneficial manner, by the due use of the horse-hoe, or hoe-plough.

Wheat, turnips, lucern, and sainfoin, and indeed every other kind of plant, when well fixed and established in the ground, may be greatly promoted in their growth, by the discreet use of the hoe-plough; but previous to the use of this instrument, they must have arrived to a certain stage of their growth, otherwise the hoe-plough would entirely displace and totally destroy them. It is, therefore, absolutely necessary, that the land in which these articles are to be sowed, should, at least, be moderately fertile, and very clean from

weeds, which can be effected only by being thoroughly pulverized previous to its being sown.

Turnips, lucern, sainfoin, clover, and many others, are very precarious articles, even when skill has been used, and great pains taken, to insure a crop. Land is sometimes sowed with turnips, three or four times to no purpose, and many other crops frequently miscarry, through circumstances which human sagacity cannot foresee, or human prudence remedy. The failure of these articles is generally imputed to the ravages of the fly ; and true it is, that they prey upon them by millions ; but if my observations are just, the evil does not begin there. It is common for the seeds of the above-mentioned plants to come up finely and look healthy ; but heat and drought coming on, the juices of the young plants thicken and stagnate, circulation is stopped, they wither, and are suddenly destroyed by the fly. It is very common to see whole fields in this condition, excepting under the shadow of the hedges, which, in some measure, retain the dews of the nights, and screen the young plants from the scorching sun-beams. We frequently see very flourishing plants under

hedges, when the crop of the rest of the field is entirely destroyed; and I am clearly of opinion, the same disappointment would happen in every poor soil, if the appearance of the plants were immediately followed by a few dry hot scorching days, though there should not be a fly to prey upon them. The best means to guard against such a disappointment, when any of these articles are to stand for a crop in the place they are sowed, is thoroughly to cleanse the ground, duly break, divide, and pulverize the soil, and dress it with a well-prepared artificial compost, which, if the season should not prove singularly unfavourable, would, most probably, give a degree of vigour to the young plants, which would totally defeat the ravages of the fly; and if the land were to be sown in drills, a very moderate quantity of the compost being regularly spread in the path of the drill, previous to the sowing the seed, would be sufficient for the purpose.

A plentiful crop of turnips, or of artificial grasses, is a matter of very great importance to a farmer who has a large stock of cattle to feed; it therefore merits his most serious attention, how and by what means he may render

the growth of those articles more constant and certain, which in the common course of practice are very precarious, and not to be depended upon. For this purpose, I would advise him to keep twenty, thirty, or fifty loads (the quantity proportioned to the extent of his farm) of a good compost always by him, ready prepared, to be used as occasion may require. This may be done at a very moderate expense in the following manner:—

Of a field that is conveniently situated, plough and harrow the headlands, till the soil be well divided and in fine tilth; then take a cart-load, or forty bushels, of good strong well-burnt lime, fresh from the kiln, and place it in little heaps, about a bushel in each, along the middle of the said headlands, about four feet distant from each other. This done, with a shovel cover the heaps of lime with four or five times its quantity of pulverized earth, and pat it down close with the back of a shovel, so as to exclude both the rain and the air. In a few days, the moisture of the earth will have dissolved the lime, and reduced it to a powder. A workman, however, should from time to time inspect the heaps, for they will soon begin to heave and swell, and have large

fissures in them, which must be carefully filled up by having more earth thrown upon them, and patted down close. This must be repeated as often as occasion may require; for rain would cause the lime to run into a kind of irreducible calx, and the air would rob it of its fertilizing quality, as it is well known it does of its medicinal virtue. When the lime is perfectly reduced to a powder, the earth and lime must be chopped down with a spade, and intimately blended and incorporated together. This is most conveniently done in form of a long bank, or ridge, in the middle of which a large furrow, or opening, must be made sufficient to receive five cart-loads (forty bushels each) of good fat spit dung; then the earth and lime must be thrown over the dung so as to cover the whole. In this manner it must lie some months, or till the dung is in a state of dissolution, which it will soon be by means of the lime. When arrived to this state, it must again be turned over, and incorporated as intimately as possible, and then formed into a heap to be kept for use. Earth, lime, and dung, thus managed, constitute an unctuous saponaneous mass of great fertility, and perhaps this is the most beneficial method of manuring with lime of any in use; for at the

same time that it promotes the growth of the crop, it meliorates and improves the soil; whereas, in the common way of using it, it is thought by most, that though it may invigorate for a crop or two, yet it infallibly impoverishes the land. It is true, however, that there is no article in the whole art of husbandry, concerning which even practical men are more divided, than about lime. Some declare they have expended large sums of money in the use of it, without deriving the least benefit from it; with others, it is the *sine qua non* of vegetation; without it, they think they had better not sow their land; indeed, the practice so far prevails in some counties, that the tenant is tied down by an article in his lease to lay on a certain quantity every third or fourth crop, from sixty to one hundred and sixty bushels an acre. It is not difficult to account for this seeming irreconcileable difference of opinions, but it would require more room and time than can be allowed at present. I will only add, that a compost formed as above, would make an excellent top-dressing to be used in the spring, and if not wanted for the purposes first-mentioned, would be very useful for the last. But from

this long digression, let us return to our subject.

We will suppose the land we have to cultivate is in its nature rather poor and unfertile, and rendered more so by being too frequently cropped, and its culture neglected, and consequently overrun with the worst kind of weeds; the question is, what mode of culture will bring such land into proper tilth, and produce a profitable crop at the same time with the least expense? To answer this purpose, I have already observed, the crop must be planted in rows with intervals sufficiently wide to admit the free use of the hoe-plough whilst the crop is growing, as often as the growth of the weeds requires it. This will be three, or perhaps four times, in such foul land, during the course of the summer. For this purpose I know only of three or four articles which will by any means answer. These are, the different species of cabbage plants, beans, potatoes, and perhaps pease. I have tried carrots, parsnips, turnips, turnip-rooted cabbage, lucern, sainfoin, and every sort of grain, but without the least success; for in spite of every effort, the weeds baffled all attempts, and destroyed the young plants

that arose from seed, before the hoe-plough could be introduced. Cabbages, beans, and potatoes, were all the articles that afforded a profitable return. The field in which I made my experiments is seven acres, and was exactly in the poor condition above described. The method I pursued to bring this field into proper tilth is as follows, and I believe a better cannot be devised.

As soon as harvest is well over, give the field a clean ploughing in the usual manner. Dragging and harrowing at this season can seldom be of any use; the earth is generally too adhesive to part with the roots which bind it together. As soon as the ploughing is finished, give it another directly across the first; but this must be performed in a manner very different from the former. Begin at the farther end of the field, and with one bout of the plough, make the furrows as deep, and the ridge as narrow and as high as may be. Upon the outward edge of the outward furrow enter the plough-share, and with another bout of the plough form a second ridge, and so proceed through the whole field. It will then lie in deep open furrows, and high narrow ridges, and consequently exposed to the in-

fluences of the atmosphere in the largest extent of superficies that is possible. If the winter should prove ever so wet, the ridges will be kept dry by the open furrows; but if it should prove severe, the frost will penetrate quite through the ridges, and impregnate almost the whole soil they contain. If in the latter end of February, or any part of March, the weather should be dry and open, the ridges may be drawn down by the drags, and the field levelled to prepare it for planting. The advantage of this method must needs be evident to every practical man, for nothing in art or nature renders even the most adhesive soil so short and friable as exposing it through the winter to the frost.

This being the state of the field, we proceed now to prepare it for planting. On the further side of the field, about a yard distant from the hedge, draw a furrow with the plough from one end of the field to the other, and return the plough again in the same furrow. This will make it wide, deep, and clean. Then enter the ploughshare about nine inches distant from the edge of the furrow, and with one bout of the plough, throw the earth on each side into the middle of the furrow. A

second bout of the plough, performed in the same manner, will form a high ridge about three feet wide. It is evident, a ridge thus formed will, under the crown or most elevated part of it, have *twice* the depth of pulverized earth that can be had in common ploughing. The whole field is to be formed into ridges in the same manner as the first. In land that is tolerably clean, and in pretty good tilth, the intervals between the ranks of plants on the tops of these ridges will be wide enough for the hoe-plough to work, and keep it so. But land in the sad condition above described, might be more conveniently and effectually cleansed and improved by forming the ridges by the bouts of the plough, which would make them about four feet and a half wide, and consequently there would be intervals of near four feet for the hoe-plough to work in. If the season should prove favourable, and the intervals ploughed three times in the course of the summer, the soil would be reduced almost to a powder.

Let us suppose then the field to be formed into *three-bout ridges* as above, and the time for planting beans arrived; with a common plough I make a clean furrow on the crown

of each ridge, about a foot wide, and four inches deep, going down one ridge and up the next, and so on through the whole field. The beans are then dropped in the furrows, either in two rows, seven or eight inches asunder, or in a single row in the middle of the furrow. If the seed be good, the distance may be three inches bean from bean; if otherwise, they should be planted closer. This may be performed very conveniently by a small hand-barrel drill, with which a boy might plant six acres a day; or for want of such an instrument, the beans might be dropped by women, boys, and girls, very expeditiously; as the furrow would be an infallible guide, which they could not mistake either in the rows or depth, though they might somewhat in the distance of the beans, but as the furrows would remain open for the present, every error would be liable to detection.

The beans being planted, they may be very expeditiously covered by a pair of harrows being lashed to a couple of poles at a proper distance to work on the tops of the ridges, and drawn by a pair of horses; one going in each furrow, two ridges may be covered at

a time, without the horses stepping upon either.

A drill, which makes the furrows, drops the seed, and covers it at the same time, conveys an idea of much greater perfection than the method here advised ; but, all things considered, I do not know but in practice this may be the more eligible method of the two, especially for beans and pease ; and for setting potatoes and cabbage plants, I think it greatly preferable to all others. A furrow made, as above, is vastly preferable to any channel that can be made with the share of a drill ; for though the share be set to a certain depth, at the discretion of the ploughman, from which it cannot deviate, yet if the soil be well pulverised, as it ought, it will run into the channels, and cause the seed to lie at unequal depths ; this in the autumn indeed, may be of no consequence, as at that season there is no danger of wanting moisture to make the seeds vegetate ; but in the spring, it is of the utmost consequence to have the seed buried at an equal and proper depth ; to the want of which, the very short crops of barley and oats were almost entirely owing the last summer. The seed that lay three or four inches deep came

up well, and ripened in good time ; but what lay shallow, either never came up at all, or, which was much worse, so late, as not to be any thing near ripe ; it was therefore cut green, and lay so long to wither before it could be safely housed, that what little was ripe and would have been good, was much reduced in its value by laying so long in the field. I am very clearly of opinion, that if the barley last season had been drilled in equally distant furrows of four inches deep, and about a foot from each other, the crop in this country had been three times as great at least, though much less than half the seed would have been sufficient ; this would have made a difference of three rents at least to the farmer.

The beans being planted, suppose the beginning of March, before the end of April a plentiful crop of weeds may be expected, notwithstanding the pains that have been taken to prevent it. Those which are in or near the rows of beans, should be cut up with the hand-hoe ; and the sooner this is done the better, after the beans are high enough for the hoer's direction. The weeds in the intervals may stand somewhat longer, till the beans are sufficiently established in the ground,

so as not to suffer from the free use of the horse-hoe. At this stage of their growth, this instrument should be introduced, and a furrow cut as near one of the ranks as may be with safety, and the earth thrown into the interval; on its return, it must cut a furrow on the other side of the row, and so on till the whole field be finished. There will then be a furrow on each side of the rows, and high ridges in the middle of the intervals. These should be well harrowed, with an instrument made of a proper width to pass between the rows, without injuring the beans. This would level the ground, break the clods, and tear out many of the weeds. A plough, with a double mould-board is then to split the ridges in the middle of the intervals, throwing one half to the right, the other to the left, to earth up the beans. Thus disposed, it may remain for a month or six weeks, or till the weeds appear. Then the hoe-plough should be set to work again, always observing to go as near the rows as may be with safety. The harrow should follow the hoe-plough, and the plough with a double mould-board the harrow; and this is to be repeated as often as there may appear to be any occasion, which cannot well

be more than three times in the course of the summer.

It makes no material difference whether the crop be beans, potatoes, or cabbage. That mode of practice which is beneficial to one, will be equally so to all. A field under this mode of culture, it is evident, would have all the advantages of a year's fallow, together with a beneficial crop. The beans being reaped and carried, the field would be thought by most to be in very good tilth for a crop of wheat. Nothing more would be necessary than to plough and harrow the intervals, which might be done with two bouts of the plough in each interval, in which two, three, or four rows of wheat might be drilled, at the discretion of the owner. But I should prefer giving it another winter's fallow, which should be performed exactly in the same manner as the former. You may then either have another crop of beans, or, which I think much better, a crop of potatoes. The land is to be prepared, and to lie fallow through the winter, as before directed for beans. The best season for planting beans is in March, but potatoes should not be planted before the middle of

April at soonest; but, in most years, the beginning of May is safer and better.

Last year I planted about three quarters of an acre the 15th and 16th of April; they came up well, and looked very fine and vigorous. On the morning of the 21st of May, there was a sharp hoar-frost, which shrivelled up the greens of the potatoes, as if they had been scorched by fire; the consequence was, the stalks died down to the ground, and appeared as if all destroyed; however, in some time they shot forth again, and produced a better crop, all things considered, than I expected. The produce was thirty-six sacks and a half on three quarters of an acre, (240lb. to the sack,) which, at 4s. a sack, (the present price here,) come to 7l. 6s. being after the rate of 9l. 14s. 8d. per acre. Had this land been prepared in the manner above described, I cannot have a doubt but the produce would have been double at least. The land was in wheat the preceding year. I could not get possession till January 1785, and by reason of snow and hard frost, it could not be ploughed till late in March. It was thrown into narrow ridges, by two bouts of the plough; and the potatoe sets, instead of being planted

in the furrows made on the crowns of the ridges, as I had directed, were, by a most unaccountable blunder, very injudiciously dropped on the hard bottoms of the parting furrows between the ridges. I had no remedy left to correct this mistake, but by running the plough up each side of the furrow; by this means new ridges were formed with the potatoe sets, exactly under the crown of each ridge, and the sets were well covered with mould very well broken; but still they lay on a bed of hard uncultivated earth, which is a very great impediment to vegetation; for though the potatoe generally grows above the set, the roots and fibres which furnish it with nourishment penetrate deep, and every way, in a well-prepared soil.

Nothing encourages and promotes the growth of all kinds of plants so much as breaking the soil as deep as the staple of the land will allow; and it is for this reason that I advise deep clean furrows should be opened, and the crown of the ridges, which are to be planted, should lie exactly over them. The furrows on the tops of the ridges need not be more than four inches deep for beans; but it must be six, *at least*, for potatoes; for almost

the whole of their produce is above the original set, and therefore should have six or eight inches to grow in.

A field thus planted with potatoes following a crop of beans, if duly cultivated with the hoe-plough, harrow, and plough with a double mould-board, as above-directed, would reduce almost any soil to a perfect tilth. The intervals might be prepared in good time for a crop of wheat, and the seed drilled in, if convenient, before the potatoes were taken up.

Fallowing land has been generally practised to restore its fertility, especially where manure is not to be got in sufficient quantities; and all experience shews that the practice is right. But none have or can have an adequate idea of the great benefit of keeping the soil in a thorough pulverized state, except those who have paid a close attention thereto.

In a very hot and dry season, I have seen cabbage and other plants which were withering and dying, seemingly beyond a possibility of recovery, restored in a very short time to a vigorous state, merely by deep hoëing, and earthing them up well. I will quote one in-

stance in particular, because it is a very remarkable one:—

The field above-mentioned of seven acres, I use for a field of experiments. About three quarters of an acre of it I had dug with the spade, in order to mark the difference between that instrument and the plough. A plot of the ground thus dug was planted with beans, in rows three feet asunder, and about four inches apart in the rows. It was wheat-stubble, very poor, and full of weeds, and dug but once. The beans came up well, but the season proved most unpromising. When three or four inches high, they appeared to be struck with the blight, and the tops were infested by a great number of insects, not unlike a large bug, which made great havock among them, and threatened the destruction of the whole, for the plants declined fast. I thought a fair opportunity now offered of trying what benefit might be derived from effectual cultivation. I caused them to be deep and well hoed, and the earth drawn up to the stems of the plants; the good effects of this were soon visible, their verdure returned, and they tillered out afresh; the weeds too came up very thick and strong, and grew apace. I then

had the intervals dug full ten inches deep, and the weeds in the rows pulled up. This gave fresh vigour to the plants, they kidded finely, and totally overpowered the weeds for that season. A few rows of these beans were gathered green for the use of the family, the remainder stood for seed. Many of them, especially those that were gathered green, put up fresh shoots from the roots, grew very strong, and even as full of bloom before winter as they had been in the summer. Many of them filled very well, and we had two or three dressings as good and as well flavoured as any of the summer. To have two crops of beans from the same roots, is, I believe, a very uncommon instance of vegetation, and certainly was owing to nothing but well-timed and effectual hoeings and digging the intervals. The remainder of the plot stood for seed ; the season for getting them in being rather unfavourable, some of the pods opened, and the beans dropped. As soon as they were housed, the ground was well dug to prepare it for a winter crop. The beans that were scattered, were dug in unnoticed, and before the end of November were shot up two feet high, very strong and luxuriant. I took up several of them carefully, to observe the progress of their

growth. The beans from which they shot firmly adhered to the stalk, from whence it appeared, that in digging the ground some of them had been buried seven or eight inches deep, it being so much from the bean to the surface of the ground, and this, instead of a stalk, had put on the appearance of a root, and was full of lateral branches and fibres the whole length. Below the bean the root had penetrated, in some eleven, in others twelve inches. How much of the fine fibres might be broken off cannot be known. Certain it is, however, that the perpendicular growth of these roots was from eighteen to twenty inches; whereas those that were planted in the spring on the same soil, much out of condition, very foul, and but once dug, had struck only about three inches deep at most. Here then we have ocular demonstration of the surprising effects which breaking, dividing, and pulverizing the soil, can produce, if done effectually, and in proper season. How amazingly great must be the luxuriance of a plant whose root is twenty inches long, and full of fibres the whole length, if compared with one of the same kind whose root is only three inches long, and proportionably small!

Another plot of the same field I planted with egg pease ; they came up well, but when a few inches high, were struck with the blight, and devoured by insects down to the ground. I began to dig them up, in order to plant something else in their room ; but observing the roots had begun to put out fresh shoots, I took the man off digging, and set him to hoeing the intervals very deep. They soon showed the good effects of this operation, they shot up vigorously, and produced not a large crop indeed, but very fine large pease. When they were nearly spent, I had the ground well dug again, and planted some hundreds of cabbage plants of different kinds. To these I gave two or three good hoeings, and in October had the finest cabbages in the neighbourhood. Perhaps many might be larger and heavier, the average weight of mine being from six and a half to seven pounds ; but nothing could exceed them in sweetness and goodness. What makes this the more remarkable is, the farmer who last occupied the land told me it would not bear a cabbage, the soil was so shallow, poor, and liable to burn.

As soon as the cabbages were cut, I had it dug again, and planted it with brocoli ; the plants grew luxuriantly, and were as healthy

and fine as ever was seen, till the severe frosts the beginning of January, 1786, gave them a severe blow. Before the snow fell, they dropped their leaves, and seemed much hurt; whether they will recover, as I hope, will appear hereafter; they are now covered with snow.

The condition as well as complexion of this part of the field (three quarters of an acre) is very much altered for the better; it has now the appearance of good garden mould, is light, easy to dig, and crumbles with great ease. This improvement of the soil is wholly owing to the culture bestowed upon it. In the course of twelve months it has been dug three times, and hoed or dug with a dung-fork with four tines (which is the best instrument I know of for shaking the weeds out of the soil) at least four times, but it never had a grain of manure of any kind whatever; *that I* purposely withheld in order to prove to what degree of improvement land might be brought by the force of cultivation solely. Hitherto the success has greatly exceeded my expectation; if the success of another year upon this same part of the field should prove superior, or even equal to the last, the fact will be

established beyond the possibility of a doubt, that land in its nature rather unfertile, impoverished, and made very foul by bad management, may, by the proper use of the spade and hoe, or the plough and harrow, be made fertile, and to bear profitable crops, without the least aid from manure of any kind whatever.

It has been observed by Mr. Tull, and by others since his time, that frequent ploughing and harrowing, and reducing the soil to a perfect tilth, increase and extend the pasture of plants; but this could be of no great use, if the matter or substance, which constitutes their aliment were not increased also. During the course of these experiments, I made several observations, which clearly explain to my own satisfaction, how dividing and pulverizing the soil becomes the proper mode of conveying the aliment, prepared by nature for the sustenance of plants, into the bosom of the earth. One observation I will mention, as it is directly to the purpose: one evening, near the time of the men's leaving work, a smart shower of rain came on, which drove them off. They were digging one of the plots where the beans had grown. The shower did not last

above half an hour. The next morning as the men were digging, I observed the rain had not penetrated above half an inch into the ground at most, I ordered one of them to dig two or three spits of the ground that had been dug the day before ; it clearly appeared that the rain in the new-dug ground had gone as deep as the spade, which was full twelve inches. Here then, we clearly see how, and by what means, the principles of vegetation are acquired, by keeping the land in thorough cultivation.

Rain, hail, snow, dews, hoar-frost, and all the exhalations which occupy the atmosphere, sink into and are absorbed by the earth when it is kept in a loose, light, pulverized state ; whereas the same principles on a compact hard soil reach no farther than the surface, and are exhaled by the sun and wind, with little or no benefit to the soil they fall on.

From hence also we may learn the *modus operandi*, by which plants in a growing state may be invigorated and rendered luxuriant. If plants of any kind were planted in rows, according to the practice of the new husbandry, and the intervals horse-hoed two or three times

in the summer; every shower of rain, even the dews of the nights, would be freely imbibed by the well-pulverized soil, and the aliment it contains directly conveyed to the roots and fibres of the plants which occupy the intervals.

That the true aliment of plants is derived from animal substances, dissolved and volatilized by fermentation and putrefaction; that the atmosphere is the grand receptacle of all putrid effluvia; that this subtilized matter enters into, and helps to constitute, the clouds and other meteors; that it attracts, and is attracted by, hail, rain, snow, &c. and by that means returned to replenish and fructify the earth; the writer himself is fully convinced. But supposing his theory, respecting the principles of nutrition be ever so erroneous, it is of no consequence to the practical husbandman; it is sufficient for him to know and to be well acquainted with a mode of practice which will infallibly render his fields fertile, and capable of producing profitable crops, by means easily practicable and within his own power, be the situation and condition of the soil whatever it may, total barrenness excepted.



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That fallowing gives fertility to the earth, is a fact confirmed by universal experience, and well known to every husbandman: but the extent of its power has been considered by few, and attempted to be carried to its utmost pitch perhaps by nobody.

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## ESSAY II.

*On the Oak.*

OF all the trees of the forest, the Oak demands our first attention, whether we consider the dignity of its station, or the variety of uses to which it is applied. Being a native of our island, it adapts itself in a wonderful manner to almost every soil; and, if well defended in its infancy, there are few places in which it will not grow to a national advantage. This tree naturally delights in a rich, deep, and loamy soil; but lands of that quality are now more profitably employed in pasture and tillage. However, there are large portions of land in this

kingdom which yield but a small profit to the owners. Such wastes, if situated near rivers, or navigable canals, are nobly calculated for raising Oaks, which, at some distant period, may launch themselves into the ocean, Guardians of Liberty and Commerce. Dr. Martyn, in his beautiful edition of Mr. Miller's dictionary, enumerates twenty-six species of Oak, but I shall only mention fourteen, of which number nine are deciduous, and five evergreen.

1. *QUERCUS (robur)* foliis deciduis oblongis superné latioribus, sinubus acutioribus: angulis obtusis. Lin. Sp. Plant. 1414. *Oak with oblong deciduous leaves, broader toward the top, having acute indentures with obtuse angles. The Common Oak.*

This is the common English Oak, which, for ship-building and other economical uses, far excels all the kinds in the known world. The following is a variety, but Mr. Miller considers it as a distinct species under the title of

*QUERCUS (farnina)* foliis deciduis oblongis obtusis, pinnato-sinuatis petiolis brevissimis, pedunculis glandorum longissimis. *Oak with oblong, obtuse, deciduous leaves, which are winged, sinuated, and have very short foot-stalks,*

with the fruit growing upon long foot-stalks.—  
*The Female Oak.*

Mr. Miller observes that this sort is not so common as the first, and he informs us, that in the Wilds of Kent and Sussex there may be seen many large trees of this kind. According to him, the leaves are not so deeply sinuated as those of the common Oak, nor are they so irregular, the indentures being opposite, like the lobes of winged leaves; these have scarce any foot stalks, but sit close to the branches; the acorns stand upon very long foot-stalks. The timber of this kind is accounted, by some, better than that of the first, and the trees, when growing, have a more lofty appearance.

2. *QUERCUS (cerris) foliis oblongis lyrato-pinnatifidis, laciniis transversis acutis, subtilis subtomentosis.* Lin. Sp. Plant. 1415. *Oak with oblong leaves which are lyre-shaped, wing-pointed, and have transverse acute jags, which are downy on their under-side.* *Quercus calyce hispido, glande minore.* C. B. P. 420. *Oak with a prickly cup and smaller acorn.—Smaller prickly-cupped Spanish Oak.*

This grows naturally in Spain. The leaves are oblong and pointed, and frequently indented in the middle like a lyre; they are jagged and acute-pointed, a little hoary on their under side, and stand upon slender foot-stalks. The acorns are small, and have rough prickly cups.

3. **QUERCUS (esculus)** foliis pinnato-sinuatis  
lævibus, fructibus sessilibus. Lin. Sp. Plant.  
1414. *Oak with smooth wing-indented leaves,  
and fruit sitting close to the branches.* Quercus  
parva sive Phagus Græcorum et Esculus Plinii.  
C. B. P. *The small Oak, or Phagus, of the  
Greeks, and the Esculus of Pliny. The cut-  
leaved Italian Oak.*

This sort grows naturally in Spain and Italy; the leaves are smooth, and deeply sinuated like winged leaves; some of the sinuses are obtuse, and others end in acute points; they have very short foot-stalks; the branches are covered with a purplish bark when young; the acorns are long and slender, the cups rough and a little prickly, sitting close to the branches. The acorns are sweet, and are frequently eaten by the poor in the south of France, who, in times of scarcity, grind them and make bread with the flour. Of this species of Oak the Romans made their Civic Crowns. “*Civica ligna primo fuit, postea magis placuit ex Exculo Jovi sacra.*” PLIN.

4. **QUERCUS (ægilops)** foliis ovato-oblongis,  
glabris, serrato dentatis. Lin. Sp. Plant. 1414.  
*Oak with oblong, oval, smooth, sawed, indented  
leaves.* Quercus calyce echinato, glande ma-  
jore. C. B. P. 420. *Oak with a prickly cup  
and larger acorn. The large prickly-cupped  
Spanish Oak.*

This species grows naturally in Spain. The trunk rises nearly as high as the common Oak; the branches extend very wide on every side, and are covered with a greyish bark, intermixed with brown spots; the branches are closely garnished with oblong oval leaves, about three inches long, and almost two broad, which are deeply sawed on their edges; most of the saws or teeth turn backward, and terminate in acute points. The leaves are stiff, of a pale green on their upper side, and downy on their under; the acorns have very large scaly cups which almost cover them; the scales are ligneous and acute-pointed, standing out a quarter of an inch; some of the cups are as large as middling apples.

5. *QUERCUS (rubra) foliis obtuse sinuatis setaceo-mucronatis.* Lin. Sp. Plant. 1413.  
*Oak with obtuse sinuated leaves, terminated by bristly points.* *Quercus Esculi divisura, foliis amplioribus aculeatis.* Pluk. Alm. 309. tab. 54. fig. 4. *Oak with broad spiny leaves, which are divided like the Esculus.* *The Red Oak.*

This sort grows naturally in Virginia, and in other parts of North America. It arrives at a large size in the countries where it naturally grows; the bark is smooth, and of a greyish colour, but that on the younger branches is darker; the leaves are six inches long, and two and a half broad in the middle; they are obtusely sinuated, each sinus ending with a bristly point, of a bright green, standing upon short foot,

stalks. The leaves continue their verdure very late in autumn, so that, unless hard frost comes on early, they do not fall till near Christmas, before which time they change their colour and become red. The acorns of this sort are a little longer, but not so thick as those of the common Oak.

6. *QUERCUS (prinus) foliis obovatis utrinque acuminatis sinuato-serratis, denticulis rotundatis uniformibus.* Lin. Sp. Plant. 1413. *Oak with oblong oval leaves, which are pointed on both sides, and have sawed sinuses, with uniform roundish indentures.* *Quercus castaneæ foliis procera arbor Virginiana.* Pluk. Alm. 300. *The Chesnut-Leaved Oak.*

This grows naturally in North America, of which there seems to be two kinds; one grows to a much larger size than the other, though this may be occasioned by the soil in which they grow. The largest sort grows in the rich low lands, where it becomes the largest tree of any of the Oaks in those countries: the wood is not of a fine grain, but is very serviceable; the bark is grey and scaly; the leaves are five or six inches long, and two inches and a half broad in the middle, indented on the edges, and have many transverse veins running from the midrib to the borders; they are of a bright green, and so nearly resemble the leaves of the Chesnut-tree, as scarcely to be distinguished from them. The acorns of this sort are very large, and have short cups. The leaves of the other are not so

large, nor so strongly veined, and the acorns are smaller and a little longer, which may arise from the soil.

7. **QUERCUS (nigra)** foliis cuneiformibus obsolete trilebis. Lin. Sp. Plant. 1413.—  
*Oak with wedge-shaped leaves, having three worn-out lobes.* Quercus folio non serrato in summitate quasi triangulo. Catesb. Car. 1. p. 20. *The Black Oak.*

This grows naturally on poor land in most parts of North America, where it never comes to a large size; the wood is of little value. The bark is of a dark brown colour; the leaves are very broad at the top, where they have two waved indentures, which divide them almost into three lobes; they diminish gradually to their base, where they are narrow; they are smooth, of a lucid green, and have short foot-stalks. The acorns are smaller than those of the common Oak, and have short cups. Of this species we have a variety or two, one particularly with trifid leaves, and another slightly trilobate, called the *Black Oak of the Plains.*

8. **QUERCUS (alba)** foliis obliquè pinnatis-dis, sinibus angulisque obtusis. Lin. Sp. Plant. 1414. *Oak with oblique many-pointed leaves, having obtuse sinuses and angles.* Quercus alba Virginiana. Catesb. Car. 1. p. 21. tab. 21. *The White Oak.*

This sort grows naturally in North America, where the wood is esteemed preferable to any of their other sorts for building, being much more durable. The bark of this tree is greyish, the leaves are of a light green, six or seven inches long, and four broad in the middle; they are regularly indented almost to the midrib. The indentures are obtuse. The leaves have short foot-stalks. The acorns greatly resemble those of the common Oak.

9. **QUERCUS (*phellos*)** foliis lanceolatis integrimis glabris. Lin. Sp. Plant. 1412. *Oak with spear-shaped, entire smooth leaves.* *Quercus sive Ilex Marilandica, folio longo angusto Salicis.* Catesb. Car. 1. p. 17. *The Willow-leaved Oak.*

This species is a large timber tree, and a native of North America. The leaves are long and narrow, resembling those of our common Willow. Hence its name. Of this sort there are several varieties, which are all included under the appellation of Willow-leaved Oaks.

10. **QUERCUS (*ilex*)** foliis ovato-oblongis indivisis serratisque petiolatis subtus incanis, cortice integro. Lin. Sp. Plant. 1412. *Ilex oblongo serrato folio.* C. B. P. 424. *Ilex arborea.* Bauh. hist. *The Ilex, or Evergreen Oak.*

This species is generally known by the title of *Ilex* or *Ever-green Oak*; of which there are several varieties, differing greatly in the size and shape of their leaves; but they all arise from acorns of the same tree, as Mr. Miller observes; nay, the lower and upper branches of the same tree are frequently garnished with leaves, very different in size and shape from each other; those on the lower branches being much broader, rounder, and their edges indented and set with prickles, but those on the upper are long, narrow, and entire. The leaves of this tree are from three to four inches long, and one broad near the base, gradually lessening to a point; they are of a lucid green on their upper side, but whitish and downy on their under, and are entire, standing upon pretty long foot-stalks; these remain green all the year, and do not fall till they are thrust off by the young leaves in the spring. The acorns are smaller than those of the common Oak, but of the same shape.

11. *QUERCUS (gramuntia)* foliis oblongo-ovatis sinuato-spinosis sessilibus subtus tomentosis, glandibus pedunculatis. Lin. Sp. Plant.

1412. *Ever-green Oak with oblong, oval, prickly, indented leaves, which are woolly on their under side, and bear acorns with foot-stalks.*—*Ilex* foliis rotundioribus et spinosis, & luco Gramuntio. Bot. Monsp. 140. *The Holly-Leaved Ever-green Oak.*

Linnæus has made this tree a distinct species, but Mr. Miller seems to think it only a variety of the former. The leaves are prickly and shaped like the Holly. Hence its name. It grows naturally about Montpelier.

12. *QUERCUS (coccifera)* foliis ovatis indivisis, spinoso dentatis glabris. Lin. Sp. Plant. 1413. *Oak with oval, undivided, smooth leaves, which are prickly and indented.* *Ilex aculeata, cocciglandifera.* C. B. P. 425. *The Kermes Oak.*

This kind of Oak grows plentifully in Spain, Provence, Languedoc, and along the Mediterranean coast. It is a tree of small growth, seldom rising above twelve feet. The leaves are oval and undivided; they are smooth on their surface, but indented on their edges, which are armed with prickles like those of the Holly. It is feathered to the bottom, which gives it the appearance of a bushy Shrub. The acorns are smaller than those of the common Oak. From this tree are gathered the Kermes, with which the antients used to die their garments of that beautiful colour called Coccineus, or Coceus, being different from the Purpura of the Phœnicians obtained from the testaceous fish called Murex. In course of time the Murex became neglected, and the Kermes, we are now speaking of, was introduced. This supported its reputation till the discovery of America, when it gave place to the Cochineal, an insect found in the Mexican woods upon a plant named by Linnæus, *Cactus Cochinillifer.*

Both antients and moderns seem to have had confused notions concerning the origin and nature of the Kermes; some considering it as a fruit, without a just knowledge of the tree which produced it; others taking it for an excrescence formed by the puncture of a particular fly, the same as the common gall produced upon the Oak. Tournefort was of this number.—Count Marsigli, and Dr. Nisole, a physician of Montpelier, made experiments and observations, with a view to further discoveries, but did not perfectly succeed. Two other physicians at Aix in Provence, Dr. Emeric and Dr. Garidel, applied themselves about the same time, and with greater success, having finally discovered that the Kermes is the body of an insect, after having undergone several transformations. The progress of these transformations must be considered at three different seasons. In the first stage, about the beginning of March, an animalcule, no larger than a grain of millet, is perceived sticking to the branches of the tree, where it fixes itself, and soon becomes immoveable; at this period it grows the most, and swells with the sustenance that it draws in: this state of rest seems to have deceived the curious observer, it then resembling an excrescence of the bark; during this period of its growth, it appears to be covered with a down, extending over its whole body like a net, and adhering to the bark; its figure is convex, not unlike a very small Sloe; in such parts as are not quite hid by this soft garment, many bright specks are perceived of a golden colour, as well as stripes running across the body from one place to

another. At the second stage, in April, its growth is completed, when it becomes round resembling a pea in shape. It has then acquired more strength, and its down is changed into dust, and seems to be nothing but a husk or a capsule, full of a reddish juice, not unlike discoloured blood. Its third state is towards the end of May, a little sooner or later according to the warmth of the climate. The husk appears full of small eggs, less than the seeds of a poppy. They are properly ranged under the belly of the insect progressively placed in the nest of down that covers its body, which it withdraws in proportion to the number of eggs: after this work is performed, it soon dies, though it still adheres to its position, rendering a further service to its progeny, and shielding them from the inclemency of the weather, or the hostile attacks of an enemy. In a good season they multiply exceedingly, having from 1800 to 2000 eggs, which produce the same number of animalcules. When observed by the microscope in July or August, that which appeared as dust, are so many eggs or open capsules, as white as snow, out of which issues a gold-coloured animalcule, of the shape of a cockroach, with two horns, six feet, and a forked tail. In Languedoc and Provence the poor are employed to gather the Kernies, the women letting their nails grow for that purpose, in order to pick them off with greater facility. The custom of lopping off the boughs is very injudicious, as by that means the next year's harvest is destroyed. Some women will gather two or three pounds a day; the great point being to know where

they are most likely to be found in any quantity, and to gather them early with the morning dew, as the leaves are more pliable and tender at that time than after they have been dried and parched by the rays of the sun. Strong dews will make them fall from the trees sooner than usual. When the proper season passes, they fall off of themselves, and become food for birds, particularly pigeons. Sometimes there will be a second production, which is commonly of a less size with a fainter tinge. The first is generally found adhering to the bark, as well as on the branches and stalks; the second is principally on the leaves, as the worms choose that part where the nutritious juice preserves itself the longest, is most abundant, and can be most easily devoured in the short time that remains of their existence, the bark being then drier and harder than the leaves.

Those who buy the Kermes to send to foreign parts, spread it on linen, taking care to sprinkle it with vinegar, to kill the worms that are within, which produces a red dust, which in Spain is separated from the husk. Then they let it dry, passing it through a searce, and make it up into bags. In the middle of each, its proportion of red dust is put into a little leather bag, and belongs to the buyer; it is then ready for transportation, being always in demand on the African coast. The people of Hinojos, Bonares, Villalba, and other parts of the kingdom of Seville, dry it on mats in the sun, stirring it about, and separating the red dust. This is the finest part, and

being mixed with vinegar goes by the name of Pastel. The same is done with the husks; but these are but of half the value of the dust. The Kermes of Spain is preferred on the coast of Barbary, on account of its superior goodness. The people of Tunis mix it with that of Tetuan, for dying these scarlet caps so much used in the Levant. The Tunesians export every year above 150,000 dozen of these caps, which yields to the Dey a revenue of 150,000 hard dollars (33,750l.) per annum for duties; so that, exclusive of the uses of the Kermes in medicine, it appears to be a very valuable branch of commerce.—In some years it has produced 30,000 dollars (5000l.) to the inhabitants of Xixona in Spain. The first who has spoken of these insects with any accuracy is Peter Quiqueran, Bishop of Senez, in his book *de Laudibus Provinciæ*, 1550.

13. *QUERCUS (suber)* foliis ovato-oblongis indivisis serratis subtus tomentosis, cortice rimoso fungoso. Lin. Sp. Plant. 1413. *Oak with oval, oblong, undivided leaves, sawed and woolly on their under side, and a fungous cleft bark. Suber latifolium perpetuo virens.*—C. B. P. 424. *The Cork-Tree.*

The leaves of this useful species are entire, of an oblong oval, about two inches long, and one and a quarter broad, sawed on their edges, and have a little down on their under sides; their foot-stalks are very short; the leaves continue green through the winter till the middle of May, when they generally fall off just

before the new leaves come out, so that the trees are very often almost bare for a short time. The acorns are very like those of the common Oak. The exterior bark of this tree is the cork, which is taken off from the trees every eight or ten years; but there is an interior bark which nourishes the trees, so that the stripping off the outer is so far from injuring them, that it rather prolongs their life; for those whose bark are not taken off, seldom last longer than fifty or sixty years in health; whereas the trees which are barked every eight or ten years, will live a hundred and fifty years and more. The bark of the young tree is porous and good for little; however it is necessary to take it off when the trees are twelve or fifteen years old, without which the bark will not be good, and after eight or ten years the bark will be fit to take off again; this second peeling is of little use, but at the third peeling the bark is in perfection, and will continue so many years, the best cork being taken from the old trees. The month of July is the time for stripping off this bark, when the sap flows plentifully; this operation is performed with an instrument similar to that for disbarking Oak. Of this species there is a variety called the Narrow-leaved Cork Tree.

14. **QUERCUS** (*virginiana*) foliis lanceolato-ovatis integerrimis petiolatis sempervirentibus. *Oak with spear-shaped, oval, entire leaves, which are Ever-green, and have foot-stalks.*—**Quercus**

*sempervirens* foliis oblongis non sinuatis. *Banist.*  
*Ever-green Oak, with oblong leaves which are not sinuated. The Live Oak.*

This species grows naturally in Carolina and Virginia, where it rises to the height of forty feet. The grain of the wood is hard, tough, and coarse; the bark is of a grey colour. The leaves are oval and spear-shaped, about three inches long, and one and a half broad, entire, and of a dark green, standing upon short foot-stalks. They are of a thick consistence, and continue green all the year. The acorns are oblong and small, and are eaten by the Indians, who lay them up in store for the winter. They also draw from them an oil which is very good.

The Oak, in the Linnæan system, is ranked in the class and order *Monoecia Polyandria*, which comprehends such plants as have male and female flowers on the same plant; the male flowers having numerous stamens.

THE OAK. Plate 1. *a.* A male Catkin. *b. c.* The Calyx. In some flowers it is divided into four; in others, into five segments. *e. c.* Ditto, magnified. *d.* An entire Flower. *b.* Ditto, magnified, showing the situation of the stamens. *c.* A single stamen. *e.* Ditto, magnified. *f.* A female Flower. *f.* Ditto, mag-

nified. *g.* The Acorn, or Nut, as it sits in its permanent Calyx. *h.* Ditto, separated from the Calyx. *i.* The Cup, or permanent Calyx.

The common Oak flowers in the spring, though there is no exact time for the opening of the flowers or leaves ; these circumstances depend on the backwardness or forwardness of the season, or the difference of the situation or soil on which the trees stand. We often observe one Oak in full leaf, and at the same time another, standing near it, without any such appearance, owing to the coldness or poverty of the stratum on which it stands, and which would have been unperceived, had not the tree shown it. But notwithstanding this, observation and experience teach us, that these differences are very inconsiderable, and that the Oak which is most backward in putting forth its leaves, generally retains its verdure the longest in the autumn. In general, the flowers, which are of a yellowish hue, begin to open about the seventh of April ; about the 18th the leaves appear, at which time the flowers are in full bloom ; and about the 6th of May the leaves will be quite out, and remain until the autumnal frosts come on.

Oaks are generally raised in vast quantities together, called woods, where they thrive best, and arrive to a greater height than in hedge-rows. We seldom see a good oak in a hedge-row: they generally throw out large lateral branches, and form a spreading and beautiful head, but the trunk is for the most part very short; whereas in woods they draw one another up, and thus sociably aspire to such a height, as to be sufficient to answer any purposes in use.

Various are the opinions of mankind about the raising an Oak wood. Some think the plants should never be removed, but remain where the acorn was first sown; others, again, believe that a wood should be raised by plants taken from a nursery. As each of these methods has its advantages, I shall, therefore, endeavour to show the best mode of proceeding in raising an Oak wood both ways, that every one may choose that which he likes the best.

And, first, to raise a wood from acorns sown in the *Seminary*.

Let a proper spot in the seminary be pre-

pared against the time the seeds are ripe. The soil should be loamy, fresh, and in good heart; and should be prepared by digging it well, breaking all clods, and clearing it of weeds, roots, large stones, &c. The acorns should be gathered from the straightest, most thriving, and beautiful trees; and if they remain until they fall off of themselves, they will succeed the better.

Having a sufficient quantity of well-ripened acorns for your purpose, proceed to prepare your beds in the ground that is just got ready for their reception. Mark out the beds with a line, four feet broad, and let there be an alley between each bed two feet wide; rake the earth out of the bed into the spaces designed for the alley, until the bed be sunk about two inches deep; then sow your acorns in the bed, about three inches asunder, and gently press them down with the spade, or, if more agreeable, they may be set in rows, the lines for that purpose being marked out with a sharp-pointed stick. Throw the earth that has been raked into the alleys, over the acorns, and, after having dressed up the bed, and gently pressed it down with the back of the spade, proceed to the next bed, and so on until the whole be finished. This work is

best performed in February, though some prefer the autumnal months.

In about six weeks the plants will appear above ground ; and in these beds they may remain two years, without any further trouble or care, than keeping them clean from weeds, and now and then refreshing them with water in very dry seasons. When the trees are two years old, they will be of a proper size for planting out.

Let us now see in what manner we are to prepare the ground for their reception. The best way is by trenching, or double digging, as deep as the soil will admit of : but as this is a very expensive proceeding, and consequently can only be practised upon a small scale, I shall recommend another good method of preparing the ground. This is to be done by proper ploughing ; and, if agreeable, the year before the land is planted, it may bear a crop of oats, rape, or turnips. By this means the sward will be effectually destroyed. After the crop is off, let the ground be trench-ploughed, and then harrowed with heavy harrows to break the clods : about the end of October let it be again ploughed cross ways,

and harrowed as before. This is the season for planting the sets ; for the ground by being thus cross-ploughed and well harrowed, will be in proper order for their reception. The manner of planting the sets is as follows :

First, carefully take the plants out of the seed-bed, shorten the tap-root, and take off part of the side-shoots, that there may be an equal proportion of strength between the stem and the root. If the wood is designed to be but small, ten, twenty, or thirty acres, then lines may be drawn, and the trees planted in rows, four feet distant from each other, and the trees two feet asunder in the row : each line must have a man and a boy for planting. The ground being made light and pliable by cross ploughing and harrowing, the man strikes his spade into the earth close to the line ; he then takes it out and gives another stroke at right angles with it ; then the boy, having a parcel of plants under his left arm, takes one with his right hand, and readily puts it into the crevice made by the spade at the second stroke : after this the man gently presses the mould to it with his foot, and thus the young Oakling is planted. He proceeds in the same manner to the next, and so on

till all is finished. An active man will, with his boy, plant 1500 or 2000 in a day; and while they are planting, others should be employed in taking up fresh sets from the seed-bed, setting them and preparing their roots. In short, a sufficient number of hands should be set to every part of this work, that the whole may be carried on with despatch and regularity, for the ground cannot be too soon furnished with its plants, after it is in readiness to receive them; neither can the plants be put too early into the ground, after they are taken up from the seminary. Those plants which are nearly of the same size should be made to occupy a large quarter together, and the weakest should be left in the seminary a year longer to gain strength.

The trees, either for small or large plantations, being in the ground, the first care should be to fence them well from cattle, and even, if possible, from rabbits and hares. The next should be, to keep them clear from weeds, that they may not be incommoded in their growth. In all lands, weeds must be carefully watched, and destroyed at their first appearance. In small plantations hoeing may do; but where the plantations are large and noble, a double-

shelving plough should be provided; and when the weeds are got two or three inches high, this must be drawn exactly down the middle of each row by horses with their mouths muzzled, somebody leading the foremost horse: this plough will effectually throw a ridge each way, so that the edge of it will be almost contiguous to the plants on both sides. This being done, the whole surface of the ground will be changed, and the weeds all buried, except a few about the stems of the plants, which a man following the plough should cut or pluck up. In this manner the ground may lie until a fresh crop of weeds present themselves; when these are about three inches high, a common plough should be provided to go up one side of the row and down the other, to plough the ridges made by the double-shelving plough, into their former places; men following with hoes to destroy such weeds as are near the stems of the trees. Thus will the whole scene be changed again: the ground will appear as new tilled; and in this condition it may remain until the weeds call for the double-shelving plough a second time, which must also be followed alternately with the common plough as occasion may require. By this means the ground will not only

be kept clean of weeds, but the earth, by constant stirring, will be more replete with nourishing juices, the gentle powers will produce their good effects, the sun will have his influence, and all the powers of vegetation will combine to nourish and set forward the infant Oak. This work must be repeated every year, until the Oaks are of a height sufficient to destroy the weeds, which may be, perhaps, in three or four years, according to the goodness of the ground in which they are planted.

When it is thought advisable to raise an Oak wood from the acorn, let the following directions be observed.

Having the ground prepared, as before directed, for the reception of the young Oak plants, and having a sufficient quantity of acorns, all gathered from the most vigorous, healthy, and thriving trees, proceed to their setting in the following manner: In the months of February and March, let lines be drawn across the ground for the rows, at the distance of four feet from each other; but if this be thought too great an interval, the rows may be made at three feet, in which case the acorns must be put down at a greater distance

from each other. Then having sticks properly rounded to make the holes, plant the acorns by the side of the lines, at the distance of ten inches asunder: let them be put down about two inches below the surface, and see that the earth be properly closed by the planting stick, to prevent the mice, or crows, from injuring the seed. In some places it is customary to sow the acorns after the plough; but where the ground happens to be stiff, great care should be taken not to cover the seed with too thick a furrow. As in this manner of sowing, the plants will come up very irregular, the mode of thinning must be left to the discretion of the planter.

The first year after planting the acorns, the weeds must be kept down by hoeing and hand-weeding; and this must be done early in the spring before the weeds get so strong as to hide the tender plants, which would occasion many of them to be destroyed in cleaning. It is also the cheapest, as well as the neatest husbandry, to take weeds down before they grow too large; for though the ground may require an additional hoeing in the spring, yet the weeds being hoed down when young, a man may hoe over a great

quantity of ground in a day: weeds cut in their tender state immediately die; whereas when they are suffered to grow old and strong, they frequently grow again, especially if rain falls soon after, perfect their seed in a short time, and thereby poison the soil of the whole plantation.

The second year of their growth, in extensive plantations, the double-shelving and common plough may be made use of, as before directed, to cultivate and keep the ground clean; and this culture should be attended to until the plants are become so large that it will not be in the power of the weeds to injure them. As plantations of Oaks from the acorn are rather precarious, it will be right to form a small seminary in the same field, to repair the intervals that may have miscarried. And here it may be necessary to observe, that this seminary should be taken from the best part of the field, and in the warmest situation, in order that the young plants may have good roots, without which they would make but an indifferent progress when planted out.

Having thus given directions for the raising of woods, both by young sets and from acorns,

I now proceed to their future management, which must be the same in both. And first, the rows being four feet assunder, and the plants two feet distant in the rows, they may stand in this manner for twelve or fourteen years, when every second plant may be taken out and sold for hoops or small poles. Now, though I say in twelve or fourteen years the plants will be of use for these purposes, yet this is only a general rule, as the different goodness of the land will make a great variation in the growth of the plants; and consequently, if the trees take to growing well, they will want thinning sooner. This business, therefore, should be left to the discretion of the person intrusted with the care of the plantation.

After every second plant is taken away, let the roots be grubbed up, not only because they will pay for their grubbing as fire-wood, but that there may be more room given for the standing plants freely to extend their roots.

The plants being now four feet assunder each way, they will require no more thinning for seven or eight years, when the healthiest and

best thriving trees must be marked to stand for timber, and the others cut down for poles, and their roots left to produce future under-wood.

In this manner the rows filled with plants from the nursery must be managed, in which case we can speak with precision with regard to thinning. The same husbandry must be applied to the rows under cultivation from the seed ; but the planter in this last method must be left to form his own ideas in respect to thinning, as no human knowledge can determine, before hand, how thick the seedling plants will appear in the rows. In rocky and mountainous soils, the plants or acorns must be put down irregularly by the spade, and the planter must be directed in this operation by the particular circumstances of the soil and situation.

In all cases of planting, shelter and warmth are particularly required. Where the plantations are flat, it may be advisable to skirt the wood with Scotch Fir, which being a hardy and quick-growing tree, is well calculated for this purpose. *Et comitem quercum Pinus amica trahit.*—CLAUD.

Birch is sometimes put between the rows of Oaks, and in mountainous situations this is a good method ; others recommend the Fir for this purpose, but it is apt to vegetate too fast and overtop the Oaks.

I shall now consider our plantations as far advanced, in which case a particular attention should be paid to the trees left for timber. These should stand from twenty to thirty feet distant from each other, which will not be too near where the trees thrive well ; in which case their heads will spread, so as to meet in about thirty or thirty-five years ; nor will this distance be so great as to impede the upright growth of the trees. This distance is recommended, that the trees may enjoy the whole benefit of the soil ; therefore, after one crop of the under-wood, or at the most two crops are cut, I would advise the stubbing up the stools, that the ground may be entirely clear for the advantage of the growing timber, which is what should be principally regarded ; but, in general, most people attend more to the immediate profit of the under-wood, than the future good of the timber, and frequently by so doing spoil both ; for if the under-wood be left after the trees have spread so far as that

their heads meet, the under-wood will not be of much value ; and yet, by their stools being left, they will draw a great share of nourishment from the timber-trees, and retard them in their growth.

Such gentlemen as are desirous of raising Oaks to plant out for standards, either in parks or in fields, for clumps, or for avenues, must train them in the following manner : Having raised them in the seed-bed, as before directed, let them remain there two years ; after which a piece of good ground must be prepared for their reception, where they must grow until they are of a size sufficient to be planted out where they are designed to remain. This ground must be trenched, or double dug ; then taking the plants out of the seed-bed, as before directed, let a man and boy plant them upon this new double-dug ground, at the distance of two feet row from row, and a foot and a half assunder in the rows. Every winter, until the plants are taken out of this nursery, the ground should be dug between the rows ; and this is what gardeners call *turning-in*. They will require no other pruning than taking off any unsightly side-shoot ; or where the tree is inclined to be

forked, taking off the weakest branch. Nor is any other precaution necessary until the time for their being planted out to continue, which must be done as follows :

First, carefully take the trees out of the nursery, and then prune the roots, which must be done by holding the plant in your left hand, that the stroke of the knife in the right may so cut the bottom of the root that the wound may be downwards ; next, take off all bruised and broken parts of the root ; and having holes prepared, in the figure of a circle, three feet in diameter and a foot and half deep, (the sward being worked and chopped small in the bottom of the holes, and some mould laid to cover it) plant the trees in such a manner that the top of the roots may be nearly level with the surface of the ground. Let the finest of the mould which was under the turf, be preserved to lap the root in ; and after the earth has regularly filled the hole, let it be pressed down with the foot, to settle it properly to the root. A little litter should be laid over the root, to prevent the wind and sun from drying the mould, and thereby retarding the growth of the tree, especially if

the planting be deferred till the spring. The plants which are of a larger size, should be properly staked to secure them from the violence of the winds; or, if they are planted where cattle or deer can come, they should be properly hurdled. After this, they will require no further care.

Oaks will not aspire to such height, or fineness of trunk, when planted in these places, as in woods; but they will form most beautiful heads, and their shade will be extensive and large:

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Behold yon Oak,  
How stern he frowns, and with his broad brown arms  
Chills the pale plain beneath him.

MASON.

The Oak will grow and thrive upon almost any soil, provided the trees be properly planted, though we cannot suppose that their growth will be equal in all places. A rich deep loamy earth is what Oaks most delight in, though they will grow exceedingly well in clays of all kinds and on sandy soils, in which last the finest grained timber is produced. Many fine trees of this texture may now be

seen growing upon Nottingham forest, particularly at Welbeck.

Having thus given a minute detail of the different methods of raising an Oak wood from the *Acorn*, the *Seed-bed*, and the *Nursery*, we are now arrived at a very important and interesting question: which makes the best timber? Mr. Evelyn decides for sowing; and if a careful observer will look into the woods that have been sown, and at the same time examine such as have been planted, he will not hesitate a moment to declare in favour of the excellent Author of the *Sylva*. The extensive plantations that have been carried on for these many years past, have been made more with a view to shade, shelter, and ornament, than to the propagation of timber; and, in order to obtain these ends in the most expeditious manner, the owners have in general followed a mistaken notion, and planted their trees too old; so that many of these woods, when they come to be felled, will greatly disappoint the expectations of the purchasers. Besides, such advanced trees when drawn from the nursery, unless planted in a good soil, will never come to good timber. On the contrary, rocky and poor soils may be

made to produce excellent timber by judiciously sowing the seeds, and carefully defending the young plants from the browsing of sheep and cattle, or the cropping of hares and rabbits. By this practice, the plants are attached to their native earth, and are strangers to the inconveniences that trees taken from a nursery are exposed to.

In Scotland, and in some of the northern counties of this kingdom, the practice of sowing their waste lands with acorns, chesnuts, beech-masts, fir-seeds, ash-keys, &c. is much recommended, and there is not the least doubt, but that posterity will enjoy the benefits arising from this judicious practice. The expense attending the sowing an acre of waste land with various seeds of forest-trees, is trifling when compared with that of planting; and if all other things were equal, that alone would be decisive. In the neighbourhood of coal and lead mines, and iron forges, such woods will become highly profitable at an early period; and considering the great demand that is constantly made from such places for all kinds of woods, it is matter of surprise that the cheap method of raising woods from

seeds and seedling plants has been so long neglected.

I have already remarked, that under every circumstance of sowing or planting, especially the former, the utmost care must be taken to fence off the young plants, lest cattle and sheep should break in and render the pains of the planter abortive.

Under some particular circumstances it may be proper to cover rocky and exposed situations with Oaks raised in a nursery. In such cases we should always plant from the seed-bed: and in order to bring up the young Oaks, where the aspect and situation happen to be unfriendly, it should be recommended to skirt the wood, to a sufficient thickness, with Scotch Firs, mixing some of them in the body of the wood. In this manner an exposed situation may be made to produce excellent timber; and when the trees are grown to a size sufficient for their own protection, the firs in the centre, which I call the nurses, should be removed, otherwise they will injure the young Oaks:

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Foster'd thus,  
The cradled hero gains from female care  
His future vigour; but, that vigour felt,

He springs indignant from his nurse's arms,  
He nods the plumy crest, he shakes the spear,  
And is that awful thing which heav'n ordain'd  
The scourge of tyrants, and his country's pride.

MASON.

On the judicious thinning and cleaning a young wood, depends much of the planter's success and profit; on which account, all gentlemen who engage deeply in planting, will find it highly necessary to appoint proper persons, whose office shall be solely confined to the superintendance of the woods. From a neglect in this particular, the hopes of half a century may be thrown away in a period of a few years.

It often happens, from natural or accidental causes, that planted Oaks grow stunted and crooked; in such cases they should be cut down at a proper season. In consequence of this judicious practice, a clean leading shoot will be obtained that will soon overtake the cotemporary trees that have not undergone the same operation. But it must be considered that no Oak should be thus headed down till two or three years after planting, or until it has completely rooted it-self in the ground. Many other kinds of Forest-trees,

under similar circumstances, may be treated in the same manner; but we must except all the Pine tribe from this operation, as in them the loss of the leading shoot is the certain loss of the tree.

An opinion generally prevails, that good lands should always be employed in Meadow; Pasture, and Tillage, and that none but the barren and rocky soils should be planted.— Such an idea is by no means founded on truth, as it may be demonstrated, that good land lying remote from a town, and near a navigable river or canal, will yield a better profit when planted, than if it had been employed in pasturage and tillage. There is, I confess, some difference, when we consider that in the one case, the profits are annual and small, and in the other, distant and large, which circumstance must materially affect the inclinations of some people; but a true Patriot, and all Planters are Patriots, will forego the present profits, and rest satisfied with having handed down to posterity a blessing of inestimable value. Full of this idea, the Patriot will set apart some good land for the generous purpose of raising timber, which at some future period may be employed in building ships for

the advancement of our commerce, and the security of our island.

As a farther encouragement to the generous planter, it may be remarked, that the best lands always produce the cleanest, quickest, and best growing timber; at the same time, the underwood springs up with an amazing and profitable luxuriancy. To such men the soil is always grateful.

When a large tract of land is designed for wood, especially if it be of an indifferent quality, it may be advantageous to attend to the following method which was recommended to me by a Gentleman long conversant in the practice of raising woods. But it must be observed, that this method can only be complied with in places where the plough can be introduced.

Plough the whole in October or November, and in the following spring plough and harrow so as effectually to destroy the turf. The land being reduced to an excellent tilth, sow it with turnip-seed about the third week in June, and when the plants are sufficiently advanced, let them be carefully hoed, which

operation must be repeated at a proper interval. After this, the crop, if possible, should be eaten upon the ground with sheep. Upon the same land another crop of turnips should be taken the succeeding year; after which the ground will be in clean and excellent condition for receiving the acorns and seeds of Forest-trees. These should be committed to the earth in the following manner.

Early in the Spring, upon one ploughing, sow one bushel, or three pecks, of oats, and at the same time sow the necessary quantity of acorns, chesnuts, ash-keys, beech-mast, fir-seeds, &c. After this, let the whole be harrowed to cover the seeds. As in all extensive tracts there are a variety of soils, it will be most judicious to sow the different seeds upon such parts as are most suitable to their respective natures. Besides, some trees, though they delight in the same sort of soil, do not grow kindly together: so that the planter will do well to consider this, and only mix such together as are found, by general practice, to grow friendly to each other. And here I beg leave to remark, that where the turnips are cultivated in drills, and well horse-hoed, the land will be in better condi-

tion for receiving the acorns, &c. than if the broad-cast method had been pursued.

In this manner an extensive wood may be raised at a small expense, as the turnip and oat crops will pay the expense of ploughing, seed, rent, and incidental charges. The tender plants being nourished, warmed, and protected by the oat stalks, will make vigorous shoots, and, having no weeds to struggle with the first summer, will push forward with amazing vigour. As the land sown in this manner will be fully stocked with plants, the feet of the reapers employed in cutting down the oats will not materially affect the seedling Oaks, which before the autumn will have made a considerable progress. The Firs, from the slowness of their growth, will be secure from injury, and the Ashes cannot be hurt, as they do not vegetate till the second year. In some parts of Norfolk, where the land, in general, is of a sandy nature, with a bed of clay or marl underneath, it is recommended by the author of the above instructions, to raise an Oak wood by sowing the acorns with a crop of spring rye: and I am well informed of the success of that method in one instance. A wood raised in this natural

manner will not only make the best timber for the uses of the carpenter and ship-builder, but will arrive at maturity many years sooner than one of the same age raised from plants drawn from the nursery. The tap-root of all trees corresponds with the leading shoot; so that when it is cut off, as in planting from the nursery, the tree is weakened in its leading shoot, but puts out more vigorously in its lateral ones. An attention to the correspondence between the branches and roots solves many of the phænomena in pruning and planting.

A wood raised in this cheap and easy manner may be thinned at proper seasons, leaving the most thriving trees to stand for timber, or (which is the most profitable way) it may be converted into a spring wood, in which case no timber should be left standing, as the copse wood will be retarded in its growth by the over-dripping of the large trees. According to the goodness of the land, the spring wood will arrive sooner or later at maturity; and as wood of that kind is a regular and constant income, after a term of years, it becomes a very advantageous method of applying land in all countries where fuel is dear.

As much depends upon keeping the seedling plants clear from weeds, it might be an improvement to the plan, if, after the oats are harrowed in, drills were drawn with a light plough all over the field at the distance of four feet from each other. Into these let the acorns, chesnuts, and other seeds be sown, after which they may be covered with rakes; the thickness, however, of the covering, and the deepness of the drills, must be regulated by the nature of the soil and the seed sown. A wood raised in this manner may be cleaned at a small expense by horse-hoeing the intervals, and hand-hoeing and thinning the rows at proper seasons; for which necessary operations, consult the directions already given for cleaning Oaks drawn from the nursery, and planted in rows. In Livonia, Courland, and Poland, where the pine and fir grow in abundance, it is the practice to prepare the land as for grain, and then sow it with pine and fir seeds in the month of April. The whole is afterwards left to nature. And thus being sown thick, the strong plants smother the weaker, and the wood advances apace. In consequence of the close standing of the trees, the lower branches drop off soon, which

clears the timber of knots. In these countries it is esteemed an injudicious practice to thin the woods till the most vigorous trees are arrived at the height of twenty feet, and then the low and smothered plants are removed. When the wood is arrived at maturity, the whole is cut down, and every fifty or sixty yards a pine, or fir, is left standing to stock the land with seeds, the ground being carefully harrowed at the time the cones of the mother trees begin to open. Others again judge it better to leave a deep skirting of trees round the place cleared of wood, with the same precaution of harrowing the ground at the time when Nature points out her sowing season.

The celebrated Marquis of Turbilly, speaking of woods raised from seeds, says, " Woods thus raised out-grow, even in a few years, those that have been planted at the same time, and cultivated by digging and dressing at a great expense. No trees are taller, straighter, and of a finer bark."

In this place I judge it necessary to remark, that the above directions are drawn from the most approved authors, as well as the private

information of gentlemen well conversant in the practice of planting; but as all countries differ in a variety of circumstances, I wish to be understood as only laying down rules subject to a necessary variation. There is nothing so dangerous in planting as obeying too servilely the directions given in books: something must be left to the planter himself.

## ESSAY III.

*On the Economy necessary for Gentlemen entering upon small Estates.*

**I**N consequence of the great influx of money into this country, arising from increased trade and manufactures, it is probable that, in the course of a few years, all kinds of necessaries will become so dear, that the great body of country gentlemen, from 400 to 600 pounds a year, will be under the necessity of either retiring into towns, or of farming their own estates. This last occupation being of a perilous nature, I have selected the following letter, for the information of such gentlemen as may think themselves within the meaning of it.

A. H.

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“ With a small, but increasing family, you have taken possession of your estate ; which, if I understand you clearly, is of the gross rental, including the lands in hand, of about 600l. a year ; and that the net receipt, every

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outgoing paid, is 460l.; this will be your whole dependence; for it cannot be prudent to reckon upon any *profit at present* from 180 acres of farm which your father occupied, and which you have in occupation.

“ The best advice I can give you, is to consider, with particular attention, how very necessary a steady and unremitting economy, upon a well-matured system, is for enabling you to live and bring up a family in the class of *gentlemen* upon such an income; and to explain, as well as I am able, how much, on such a plan, will depend on your husbandry being rendered gradually so beneficial as to make a material object to increase it, as the several farms become vacant of which your estate consists; a prospect by no means admissible on any other principle than that of your making 180 acres yield an unquestioned *profit* before you take any more, and so proceeding with respect to every successive farm.

“ And this observation, as well as all I shall make, ought to rest on your having a just idea of what such an income as 460l. will enable a family, *in such times as these*, to effect; for

it is less, I doubt, than you conceive. You must remember the many instances of such estates in my knowledge, and, I believe, in your own, which have been dissipated by their owners, I might almost say without *dissipation*, by their not having a due sense of those increased expenses of living, not marked so much by the price per pound of necessaries, as by the more luxurious and elegant ideas which have pervaded every class of the people; and which appear in building, fitting up, and furnishing houses; in gardens, table, equipage, dres, pleasures, education, &c. Nothing but a rigid prudence can keep a man in the class he was born in with any estate that ranks with yours. If you think it possible for you to associate with men of 700l. 800l. or 1000l. a year, upon any thing like equal terms, you must either be ruined, or pay too dearly, through a month's uncomfortable restrictions, for the pleasure, mixed with much trouble, of a few days. For want of these reflections, hundreds have been ruined without vices, without any particular extravagance, and merely by a general notion, that they could go on for the last ten or fifteen years as they did for as many preceding. But the fact is, that the increase of taxes, uniting with the increase of

the luxury of men, with money flowing in from very different sources than any enjoyed by country gentlemen of small estates, have doubled, and in some cases trebled the expense of living; so that if these heavy burdens are not carefully provided for in the first instance, distress, debts, and ruin succeed.

“ Let me then most earnestly advise you, in the first year to square all your expenses to only two-thirds of your sure and certain income. You cannot deduct less than 60l. for taxes not attaching to the land; there remain 400l.; two-thirds of which are 266l.; on no account spend one shilling more in the first year of house-keeping.

“ Now you will observe that this is directly the reverse of what we commonly see. The first year a young couple marry, they make an extra *show*; and the first year a man comes to his estate, he usually makes some addition to, or alteration in his house; or he pulls down walls, throws down yew-hedges, cleans about him, and gets into a train of improvements, which it is possible he had been meditating before he came to it. Small windows, awkward dark passages, windy floors, and a hundred

other things are nuisances ; and then friends are ever ready with projects and advice. *Nothing more palpable ; the improvement speaks itself !*—Mighty well ; but turn a deaf ear, though the expense be but five pounds. When the first year is over, and you have the third of your income, or 133*l.* in pocket, and not a debt upon earth, you may consider what is best to do with it ; but to lay out a shilling before you know whether you will have it in a real surplus, is, upon system, the conduct which has sent so many little estates the road I hope yours will not travel. The observation is equally applicable to your agriculture ; that is a very pleasant employment, and improvements and experiments are very pleasant also ; but for one year, at least, go on as your father did without variation : he was a prudent man, and did not lose : at least know by trial that you *can* go on without loss before you listen to any proposals of improvement.

“ But, perhaps, it will be said, how are you to live upon 266*l.*? Firmness and resolution will do any thing ; and when the comfort of your whole life is at stake, I am sure they can never be more powerfully called for. You

must proceed upon plan. Your own clothes, your wife's clothes, and your children's, so much; servants' wages, and all other payments, not for house-keeping, so much; deduct these from 266l. and divide the remainder by fifty-two, it gives your weekly income; by paying ready-money for every thing, you will know in seven days if you exceed, and how much, and then can regulate accordingly. Such a systematic method of going on has very little trouble in it, and it is positively safe, which no other way to be devised is. Of all other things, be careful to keep accurate accounts of your expenses under every head, and of your farm; and let them be, in effect as well as theory, the basis of experience; they will prove so: but remember all is confusion and danger the moment you have bills; for every thing depends on ready-money transactions of every kind. A prudent man would live on a crust, and go in rags, rather than live on any sort of trick. He who lives at a rate of which he is ignorant, spends he knows not what, he is subject to imposition, he is in difficulties before he dreams of any, and his life becomes imbibited for want of a few grains of resolution at setting out.

“ Another point is, to consider consumption as expense.—You have found wine in the cellar, perhaps other things ; if you take out a dozen, nay a bottle, enter it as paid for ; by this you will avoid an obvious fallacy : put the money by itself, it will be ready to replenish.

“ Now mark the advantages of such a conduct : at the end of the year you will have 133*l.* cash in hand ; you have had a year’s experience ; you reflect on a very restricted, perhaps uncomfortable way of living ; you may then consider whether it is better to go on so, and expend such a surplus in such improvements as you have observed to be most wanting, or whether it will not be more advisable to live better, and keep other things as you found them. You are the master, you can do either ; or you may mix the plans—live rather better, and improve a little ; but with such an income the likely result is, that you will find the expenses of living *comfortably* will leave little for any thing else.

“ One thing, however, there is, which ought never to be forgotten—you are a Christian, and I hope a good one, sufficiently to know that the wants of your poor neighbours are a

call to which he only can attend who lives with economy. If you spend all on yourself and family, what can you do for others? And though your income is small, yet, comparatively, it is very great, and this is a demand which ought never to be waved. None can expect God's blessing, who do not think of this call upon their humanity in the arrangement of expenses.

“ Let me further urge you most warmly to lay down a plan of expense, at all events, that leaves you some surplus at the end of the year. I do not think that any prudent man should regularly spend more than three-fourths of his net income; such a saving, not for the purposes of hoarding, or growing in any degree rich, is essential to his comfort: if he cannot attain one-fourth, let it be one-sixth, or a least one-eighth; at all events, let it be something: without something free at the year's end, it is impossible he should ever be in tolerable comfort.

“ I have heard a right reverend prelate, of great knowledge and ability, declare, that a country clergyman of 300l. a year could not afford to drink wine; the assertion was re-

ceived with some doubt, not by me, for I believe it is correct, and that calculation would prove it. Your *free* income of 400l. will admit of no excess in any thing; which is easily proved. Suppose we allow 60l. for the dress of yourself and wife, and 20l. for that of your children, (being young;) wages of two maids and a boy 15l.; garden labour 10l.; necessary repairs of furniture, books, newspaper, stable sundries, garden ditto, &c. 15l.; here are 120l.; remain 280l.; this is 5l. 8s. a week for house-keeping, medical assistance, charity, and every unforeseen expense; and this with children that are young. There is further to be deducted that saving, which, at all events, is to be looked to in the first instance, be it but the 8s.

“ Is it not evident, from this account, that such an income must be managed with an economy approaching privation in many articles, or distress must enter. In conversation, an estate of 600l. a year is sometimes talked of in a style that shows the world does not calculate. The gross income has nothing to do in such accounts; bring it to the net receipt, taxes, &c. paid, and then you will find ground for very different ideas. But these

few items are sufficient to prove, that an estate of 600l. a year will not permit its owner to keep a regular footman, nor any carriage beyond a whiskey, without drawing on a farm in hand, or reducing house-keeping to penury rather than economy. From all which it is sufficiently clear, that such a country gentleman must farm, and with success, or he must be deprived of many very essential comforts of life.

“ Such accounts explain to us the reason of little estates being every where swallowed up by large ones. Nineteen young men in twenty, and many old ones also, that come to small estates, are ruined before they are well turned in their new situation; and this is for want of calculating their abilities, examining what they can spend per week, and paying ready-money.

“ As to your husbandry, you are to remember, that this is the only possible means you have of bettering your condition in life; by gradually increasing your farm, (but never doing it without the land already in hand being *profitably* conducted,) you may very materially improve your income; and by thus

advancing in a branch of industry, you take advantage of that *rise of times* which crushes people of small incomes, who cannot advance with the progress of others. As you have no particular pursuit to occupy your time, I do not see that you can have a better than this. Your soil is not the most favourable, but it does not demand any very expensive exertions; the tract being small, you are to remember, that great economy and carefulness are necessary; and this upon principle; because a very small loss in labour, for want of attention, by perpetually recurring, will grow into a material object upon the whole year's account. Very many farmers save more than they make; and others, after deducting the value of their own labour, and that of their children, do not make more than a living. Except upon particular soils, farming is not a profitable employment of money, compared with many others; and I urge this the rather, that you may be assured it will not answer, unless well followed, and judiciously conducted."

## ESSAY IV.

*On the Aphides.*

THE *Aphis* or Blighter, as we now, for the first time, venture to call it, from its being the most general cause of what are termed blights in plants, forms a highly interesting tribe of insects. In point of number, the individuals of the several species composing it surpass those of any other genus of this country \*.

These insects live entirely on vegetables. The loftiest tree is no less liable to their attacks, than the most humble plant. They prefer the young shoots on account of their tenderness, and on this principle often insinuate themselves into the very heart of the plant, and do irreparable mischief before they are discovered. But for the most part they beset

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\* Reaumur, considering each *Aphis* as bringing forth ninety young, calculates that in five generations the produce from a single one would be five thousand nine hundred and four millions nine hundred thousand,

the foliage, and are always found on the under side of the leaf, which they prefer, not only on account of its being the most tender, but as it affords them protection from the weather, and various injuries to which they would otherwise be exposed. Sometimes the root is the object of their choice, which, from the nature of these insects, one would not *a priori* expect; yet have I seen the roots of lettuces thickly beset by them, and the whole crop rendered sickly and of little value: but such instances are rare. They rarely also attach themselves to the bark of trees, like the *Aphis salicis*, which being one of our very largest species, and hence possessing superior strength, is enabled to penetrate a substance harder than the leaves themselves.

As among Caterpillars we find some that are constantly and unalterably attached to one or more particular species of plants, and others that feed indiscriminately on most sorts of herbage; so it is precisely with the *Aphides*: some of them are particular, others more general feeders.

As they resemble other insects in the above respect, so do they also in being infinitely more

abundant some years than others ; and though, with regard to certain insects, this variation (sometimes wonderful in the extreme, as in the brown-tail moth which ravaged the quickset-hedges in 1782) is not easily accounted for, it is solved without much difficulty as to the *Aphis*, as will be shown in the sequel. In the year 1793 they were the chief, and in 1798 the sole cause of the failure of the crop of hops. In 1794, a season almost unparalleled for drought, the hop was perfectly free from them, while peas and beans, especially the former, suffered very much from their depredations. Beans were, in 1798, almost wholly cut off by them ; indeed they suffer more or less every year by a black species of *Aphis*, particularly the latter crops. To potatoes, and even to corn, we have known them some years prove highly detrimental, and no less so to melons. To plants in stoves, greenhouses, and frames, where, from the warmth and shelter afforded them, a preternatural multiplication takes place, they prove extremely injurious, and many a rare and valuable plant also in the open ground of our botanic gardens, falls a victim to these general predators. Seeing, therefore, that our necessities as well as luxuries of life, are so materially affected by the

insects of this genus, an attempt to ascertain some of the curious and important facts relative to their history, and to make them more generally known, will not, we trust, be unacceptable to the public. Such inquiries may possibly lead to the means of obviating the injuries they occasion ; and if they fail in this, they may tend at least to correct the erroneous notions entertained of blights, not by the vulgar and illiterate merely, but even by persons of education, who may frequently be heard to maintain that these insects are brought by the East winds ; that they attack none but sickly plants ; with other notions, all as false, in fact, as unphilosophical in principle.

Locusts and Caterpillars, famed for their devastations, are furnished with strong jaws, by means of which they crop and wholly devour the foliage of plants. The *Aphis* destroys them in a different way. Instead of jaws and teeth, it is provided with a hollow pointed proboscis or trunk, which, when the animal is not feeding, folds under its breast. With this instrument it pierces the plant, and imbibes its juices to support itself ; but these juices being essential to the life of the plant, it follows that, when they are drawn off, the

plant, exhausted, flags and perishes, being, in fact, literally bled to death by these leech-like animalcules. Yet, so tenacious of life are plants in a healthy state, that they in general only fall victims to the continued attacks of these insects when in immense numbers. But it most commonly happens, that if they do not wholly destroy a plant, they deface it, and a small number of *Aphides* are sufficient to produce this effect. The leaves of such trees and plants as have a firm texture and strong fibres, though infested with these insects, preserve their form; but the more tender foliage of others, and flowers in general, cannot bear their punctures without curling up and becoming distorted; in consequence of which they lose their beauty entirely and irretrievably. The cultivators of plants, especially in stoves and green-houses, cannot be too much on their guard against the whole tribe of *Aphides*; for with what pleasure can a large or choice collection be viewed, when there is scarcely a plant but what exhibits symptoms of disease occasioned by vermin?

As the species of this genus are very numerous and afford but few marks of distinction, Linnæus has contented himself with giving most of them trivial names, according

to the particular plant on which they are found: a close attention to them will, however, disclose more distinctive characters than naturalists are aware of.

*Aphides* are described, by the best informed authors, as being generally oviparous and viviparous at different periods of the same year. Mons. Bonnet, who had the honour of making this discovery in 1740 \*, says, that in the summer the females are viviparous, but toward the middle of autumn they lay real eggs. De Geer observes, that the females of all the *Aphides* he had seen, constantly laid eggs, intended to preserve the species during winter, and that he is therefore inclined to believe that the same takes place in all *Aphides* whatever. From the 24th of September to the 6th of December following, during which time Fahrenheit's thermometer had been as low as 29, I found the *Aphis salicis* to be constantly viviparous, though, from the inclemency of the weather, very few of these insects, at the period last-mentioned, remained on the trees, and those few were soon after entirely cut off, by the unusual cold that took place,

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\* Or rather Mons. Trembley. See his Letter to M. Bennet from the Hague; *Œuvres de Bonnet*.

the thermometer falling to 4 degrees below O. Other *Aphides* are oviparous or viviparous according to the temperature of the air to which they are exposed. In very cold weather they are oviparous, for this obvious reason: the eggs are capable of resisting cold more powerfully than the young. On the 22d of November, same year as above, I found a considerable number of eggs which had been deposited in some auricula plants by a small green *Aphis*, which infests plants very generally \*, while the same species on a geranium that I kept within doors, produced young. In mild winters I have observed, in the month of January, the same species of *Aphis* in great numbers on various species of primula without doors, and all the females viviparous. These are facts which prove that all *Aphides* are not oviparous and viviparous at the same season, but that some may be wholly viviparous; that all such as are both oviparous and viviparous do not lay eggs toward the middle of autumn, nor at

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\* These eggs were laid in small, irregular groups, on the upper as well as on the under side of the leaves; they were of a perfectly black colour, and very visible to the naked eye. I found afterwards that the eggs, when recently excluded, were green, from which colour they gradually changed to that which rendered them so conspicuous. They were slightly attached to the leaf.

all during the winter, unless a certain degree of cold takes place.

Most people will think it a matter of very little moment to mankind whether an *Aphis* comes into the world with its head or its heels foremost:—it may be so; yet, as nature's historian, it is perhaps incumbent on us to notice this circumstance. The young *Aphis* then is ushered into the world with its feet foremost, see Tab. V. fig. 1. Linn. Trans. V. 5. and this act of parturition, unimportant as it may appear, serves to display the wisdom of the all-provident Author of Nature. The female *Aphis*, is usually delivered of its offspring as it sits close to the bark of the tree, but not suddenly and all at once. Two thirds of the body of the young one is quickly protruded. When it gets so far, the power of expulsion ceases, and the delivery proceeds slowly. Time is thus given to the young one to learn the use of its legs, which it soon kicks about briskly, and the first service it employs them in, is to clean away a white substance, the remains, perhaps, of the membrane in which it was enveloped in the womb. But what is of greater consequence is, that it is enabled by their use to cling fast to the bark of the

tree as soon as it is brought forth, and thus to obtain its necessary nutriment.

Of some of the circumstances attendant on the propagation of these minute animals, accounts are related, deviating so wonderfully from the common course of nature, that they could not be credited, were not the authors of them known to be men of the nicest and most accurate observation and of the strictest veracity. On this part of the subject I have little to say from my own observation, but, as some account of so extraordinary a part of their history may be expected in a paper of this sort, I shall state the facts, briefly observing that neither in the *Aphis salicis*, which at times I have watched with great attention, nor in any other species of *Aphis*, did I ever observe any sexual intercourse to take place. Whether this has arisen from the extreme infrequency of such a procedure, or from my not having observed these insects at a proper time of the year, I know not: but most undoubtedly, such intercourse does not take place between the different sexes of *Aphis* as in other insects. Yet Mons. Bonnet, who may be said to have almost taken up his abode with these insects, informs us that he has frequently noticed such

connexion, which he describes as taking place at one certain time of the year only ; and that, from a female thus impregnated, many successive generations will be produced without any further impregnation. He took the *Aphides* as soon as brought forth, and kept each individual separate. The females of such brought forth abundance of young. He took the young of these and treated them precisely in the same manner. The produce was the same ; and thus he proceeded to the ninth generation with the same success : and so far from considering that as the utmost extent of the effect, he thinks it might be carried on to the thirtieth generation.

In most species of *Aphides*, both males and females acquire wings at certain seasons ; but in this respect they are subject to great variation, there being some males and some females that never have wings ; again, there are some females that become winged, while others of the same species do not.

In the quality of the excrement voided by these insects, there is something wonderfully extraordinary. Were a person accidentally to take up a book in which it was gravely asserted

that in some countries there were certain animals which voided liquid sugar, he would soon lay it down, regarding it as a fabulous tale, calculated to impose on the credulity of the ignorant; and yet such is literally the truth.

The superior size of the *Aphis salicis* will enable the most common observer to satisfy himself on this head. On looking steadfastly for a few minutes at a group of these insects while feeding on the bark of the Willow, one perceives a few of them elevate their bodies and a transparent substance evidently drop from them, which is immediately followed by a similar motion and discharge like a small shower from a great number of others. At first I was not aware that the substance thus dropping from these animals at such stated intervals was their excrement, but was convinced of its being so afterwards; for, on a more accurate examination, I found it to proceed from the extremity of the abdomen, as is usual in other insects. On placing a piece of writing paper under a mass of these insects, it soon became thickly spotted; holding it a longer time, the spots united from the addition of others, and the whole surface assumed a glossy appearance.

I tasted this substance, and found it to be as sweet as sugar. I had the less hesitation in doing this, having observed that wasps, ants, flies, and insects without number, devoured it as quickly as it was produced: but, were it not for these, it might no doubt be collected in considerable quantities, and, if subjected to the processes used with other saccharine juices, might be converted into the choicest sugar or sugar candy. It is a fact also, which appears worthy of noticing here, that, though the wasps are so partial to this food, the bees appear totally to disregard it.

In the height of summer, when the weather is hot and dry, and *Aphides* are most abundant, the foliage of trees and plants (more especially in some years than others) is found covered with, and rendered glossy, by a sweet clammy substance, known to persons resident in the country by the name of *Honey-dew*; they regard it as a sweet substance falling from the atmosphere, as its name implies.

The sweetness of this excrementitious substance, the glossy appearance it gave to the leaves it fell upon, and the swarms of insects this matter attracted, first led me to imagine

that the honey-dew of plants was no other than this secretion, which further observation has since fully confirmed. Others have considered it as an exudation proceeding from the plant itself. Of the former opinion we find the Rev. Gilbert White, one of the latest writers on natural history that has noticed this subject\*.

But that it neither falls from the atmosphere, nor issues from the plant itself, it is easily demonstrated. If it fell from the atmosphere, it would cover every thing on which it fell indiscriminately, whereas we never find it but on certain living plants and trees. We find

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\* " June 4th, 1783. Vast honey-dews this week. The reason of these seems to be, that in hot days the effluvia of flowers are drawn up by a brisk evaporation, and then in the night fall down with the dews, with which they are entangled.

" This clammy substance is very grateful to bees, who gather it with great assiduity; but it is injurious to the trees on which it happens to fall, by stopping the pores of the leaves. The greatest quantity falls in still, close weather; because winds disperse it, and copious dews dilute it, and prevent its ill effects. It falls mostly in hazy warm weather." See *White's Naturalist's Calendar*, p. 144.

it also on plants in stoves and green-houses covered with glass. If it exuded from the plant, it would appear on all the leaves generally and uniformly; whereas its appearance is extremely irregular, not alike on any two leaves of the same tree or plant, some having none of it, and others being covered with it but partially.

But the phænomena of the honey-dew, with all their variations, are easily accounted for by considering the *Aphides* as the authors of it. That they are capable of producing an appearance exactly similar to that of the honey-dew, has already been shown. As far as my observation has extended, there never exists any honey-dew but where there are *Aphides*; such, however, often pass unnoticed, being hid on the under-side of the leaf. Wherever honey-dew is observable about a leaf, *Aphides* will be found on the under-side of the leaf or leaves immediately above it, and under no other circumstances whatever. If, by accident, any thing should intervene between the *Aphides* and the leaf next beneath them, there will be no honey-dew on that leaf. Thus, then, we flatter ourselves to have incon-

trovertibly proved that *Aphides* are the true and only source of the honey-dew.

We have found that where the saccharine substance has dropped from *Aphides* for a length of time, as from the *Aphis salicis* in particular, it gives to the surface of the bark, foliage, or whatever it has dropped on, that sooty kind of appearance which arises from the explosion of gun-powder, which greatly disfigures the foliage, &c. of plants. It looks like, and is sometimes mistaken for, a kind of black mildew. We have some grounds for believing that a saccharine substance, similar to that of the *Aphis*, drops from the *Coccus* also, and is finally converted into the same kind of powder.

In most seasons the natural enemies of the *Aphides* are sufficient to keep them in check, and to prevent them from doing any essential injury to plants in the open air. But seasons sometimes occur very irregularly indeed, on an average, perhaps, once in four or six years, in which they are multiplied to such an excess, that the usual means of diminution fail in preventing them from doing irreparable injury to certain crops.

In severe winters we have no doubt but *Aphides* are very considerably diminished ; in very mild winters we know they are very considerably increased ; for they not only exist during such seasons, but continue to multiply. Their enemies, on the contrary, exist, but do not multiply, at least in the open air, during such periods ; and thus the *Aphis* gets the start of them, and acquires an ascendancy, which once acquired is not easily overcome by artificial means, upon a large scale at least, in the open air. Vain would be the attempt to clear a hop-garden of these pernicious vermin, or to rescue any extensive crop from their baneful effects. Violent rains, attended with lightening, have been supposed to be very effectual in clearing plants of them ; but in such case more is to be attributed to the plants being refreshed and made to grow by the rain, of which they stood in need, than to any destruction of the *Aphides* themselves, which, on an accurate examination, will be found to be as plentiful after such rains, as they were before ; nor is wet so injurious to these insects as many imagine, as is evident from the following experiment : On the 12th of May, 1799, I immersed in a glass of water the foot-stalk of a leaf of considerable length, taken

from a stove plant, beset with *Aphides* of a dark lead colour, which were feeding on it in great numbers. On immersion they did not quit the stalk, but immediately their bodies assumed a kind of luminous appearance from the minute bubbles of air which issued from them. They were put under water at a quarter past six in the evening, and taken out at a quarter past ten the next morning, having continued immersed sixteen hours. On placing them in the sun-shine, some of them almost immediately showed signs of life, and three out of four, at least, survived the immersion. One of the survivors, a male, very soon became winged, and another, a female, was delivered of a young one. Many years before this experiment, with a view to destroy the *Aphides* which infested a plant in my green-house, I immersed one evening the whole plant, together with the pot in which it grew, in a tub of water. In the morning I took out the plant, expecting with certainty to find every *Aphis* dead; but, to my great surprise, they soon appeared alive and well: and thus, in addition to the other extraordinary phænomena attendant on these insects, we find that they are capable of resisting the effects of immersion in water for a great length

of time. When taken from the plant on which they feed, and kept under water, they do not survive so long ; their struggling in that case perhaps exhausts them sooner. This part of the subject might be pushed much further : it is sufficient for our purpose to have shown that wet is not so hurtful to them as is generally imagined.

Though no mode of destroying *Aphides* will, perhaps, ever be devised on a larger scale in the open air by artificial means, we can accomplish it most effectually when they infest plants in stoves, green-houses, and frames, or in any situation in which we can envelope them for a certain time in clouds of smoke. Powders, or liquids, however fatal to *Aphides*, must ever be ineffectual, from the trouble and difficulty of applying them so that they shall come in contact with those insects, situated as they usually are ; but in this respect smoke has every advantage, it penetrates and pervades their inmost recesses. The smoke of common vegetables, however powerful, is found to be inadequate to their destruction, and hitherto no other than that of tobacco is found to be effectual. That, judiciously applied, completely answers the purpose, without

injuring the plant. It mostly happens in well managed houses, that a few plants only are infested with *Aphides*: in such a case the smoaking of the whole house is a business of unnecessary expense and trouble; and we would recommend to persons who have large collections, to make use of a box of a commodious form, that shall hold about a dozen plants of various sizes, to be used as a sort of hospital, in which infested plants may be smoaked separately, and the insects more effectually destroyed, because it may be rendered more perfectly smoke tight.

To prevent the calamities which would infallibly result from the accumulated multiplication of the more prolific Animals, it has been ordained by the Author of Nature, that such should be diminished by serving as food for others. On this principle, we find that most animals in this predicament have one or more natural enemies. The helpless *Aphis*, the scourge of the Vegetable Kingdom, has to contend with many. The principal are the *Coccinella*, the *Ichneumon Aphidum*, and the *Musca-Aphidivora*. Such as are unacquainted with the history of insects will learn with

some surprise that the *Coccinella* \*, a common insect, well known even to children by the name of the Lady-Bird, is one of the greatest destroyers of the *Aphides*, which indeed are its only food, its sole support, as well in its perfect as in its larva or grub state. During the severity of winter, this insect secures itself under the bark of trees, or elsewhere †. When the warmth of spring has expanded the foliage of plants, the female deposits its eggs on them in great numbers, from whence, in a short time, proceeds the *Larva*, a small grub of a dark lead-colour, spotted with orange: these may be observed in the summer season running pretty briskly over all kinds of plants; and if narrowly watched, they will be found to devour the *Aphides* wherever they find them. The same may be observed of the Lady-Bird in its perfect state. As these insects in both their states are very numerous, they con-

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\* All the different species of *Coccinella* feed on *Aphides*; the *bipunctata*, by far the most common, does the most execution.

† Many are found in houses; for early in May, 1799, I counted on the window of my common sitting room, exposed to the sun, nineteen of the *Coccinella bipunctata*.

tribute wonderfully to diminish the number of *Aphides*. There is a saying which humanity has put into the mouths of children in favour of this insect \*, now rendered more sacred by its great utility, which has happily rendered it a sort of favourite with them, and contributes usually to its escape from their dangerous clutches. Another most formidable enemy to the *Aphis* is a very minute, black, and slender Ichneumon fly, the *Ichneumon Aphidum* of Linnæus. The manner in which this insect proves so destructive to the *Aphis*, is different from that of the Lady-Bird. The female Ichneumon, of which numbers may be found where *Aphides* are in plenty, settles on a stalk or leaf, more or less covered with them, marches slowly over their bodies, feeling with its *antennæ* as it proceeds for one of a suitable size and age; which having discovered, it pushes forward its body, or abdomen, in an incurved state, and with a fine instrument at its extremity, invisible to the naked eye, punctures, and deposits an egg in the body of the *Aphis*; which having done, it proceeds, and lays an egg in a similar way in the bodies

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† Lady-bird, lady-bird, fly away home!—your house is on fire, your children at home.”

of many others. The egg thus deposited quickly hatches, and becomes a small *larva*, or maggot, which feeds on the substance of the *Aphis*, and, having eaten the whole of it, the skin excepted, it changes to a *pupa*, or chrysalis; in which state, when it has remained a sufficient time, it becomes an Ichneumon fly, which eats its way out of the *Aphis*, leaving the dry inflated skin of the insect adhering to the leaf, like a small pearl. Such may always be found where *Aphides* are in plenty. We have observed different species of *Aphides* to be infested with different Ichneumons.

In general the torpid *Aphis* submits quietly to this fatal operation; but we have observed some of them, especially one that feeds on the Sycamore, which is much more agile than many of this race, endeavour to avoid the Ichneumon with great address.

There is, perhaps, no genus of insects which in their *larva*, or maggot state, feed on such a variety of food as the *Musca*, or Fly. There is scarcely a part of nature, either animate or inanimate, in which they are not to be met with. One division of them, called by Linnæus

*Musca Aphidivora*, feeds entirely on *Aphides*. Of the different species of aphidivorous flies, which are numerous, having mostly bodies variegated with transverse stripes, their females may be seen hovering over plants infested with *Aphides*, among which they deposit their eggs, on the surface of the leaf. The *larva*, or maggot, produced from such eggs, feeds, as soon as hatched, on the younger kinds of *Aphis*; and, as it increases in size, attacks and devours those which are larger. These *larvae* are usually of a pale colour, adhere closely to the leaf, along which they slowly glide, and are formed very tapering towards the head. When fully grown, they change to a *pupa*, or *chrysalis*, attached to the leaf, from whence issues the fly. The *larvae* of these flies contribute their full share to diminish the despoilers of Flora. To these three kinds of insects, which are the chief agents in the hands of Nature for keeping the *Aphides* within their proper limits, we may add a few others which act a subordinate part in this necessary business of destruction.

The *larva* of the *Hemerobius* feeds on them in the same manner as that of the *Musca Aphidivora*, and deposits its eggs also on the

leaves of such plants as are beset with *Aphides*. The eggs of this *Hemerobius* stand on long filaments, which are attached by a base to the leaf, and have more the appearance of the filaments of flowers with their *antheræ* than the eggs of an animal. The number of these insects being comparatively very small, they may be considered rather as the casual invaders of their existence than the main host of their destroyers.

The Earwig, which is in itself no contemptible enemy to plants, makes some atonements for its depredations by destroying the *Aphides*; especially such as reside in the curled-up leaves of fruit-trees, and the purses formed by certain *Aphides* on the poplars and other trees.

Lastly, we may add as the enemies of these creatures, some of the smaller soft-billed birds, which feed generally on insects, and which may frequently be seen busily employed in picking them from the plants. Their utility did not escape the observation of the pleasing author of the seasons. We shall quote the whole of what he writes on this subject, presuming that none of our readers will think it

too long ; remarking, however, that he has fallen into the error of most others in regard to the manner in which these insects are said to be brought by the easterly winds, and that he confounded the mischiefs of caterpillars with those of the *Aphis* :

“ For oft engender'd by the hazy north,  
Myriads on myriads, insect armies warp  
Keen in the poison'd breeze, and wasteful eat  
Thro' buds and bark into the blacken'd core  
Their eager way. A feeble race ! yet oft  
The sacred sons of vengeance, on whose course  
Corrosive famine waits, and kills the year.  
To check this plague, the skilful Farmer chaff,  
And blazing straw, before his orchard burns,  
Till, all involv'd in smoke, the latent foe  
From every cranny suffocated falls ;  
Or scatters o'er the blooms the pungent dust  
Of pepper, fatal to the frosty tribe ;  
Or, when the envenom'd leaf begins to curl,  
With sprinkled water drowns them in their nest ;  
Nor, while they pick them up with busy bill  
The little trooping birds unwisely scares.”

When plants assume a sickly appearance, or are disfigured by disease, from whatever cause the disease may arise, they are said to be blighted. Blights originate from a variety of causes, the chief of which are unfavourable weather and insects.

Two opinions prevail very generally in regard to blights ; the one, that the insects which are the cause of them, are brought from a distance by easterly winds ; the other, that they attach themselves to none but plants already sickly. Neither of these opinions, as far as I have observed, is founded in fact. I am induced, from the numerous observations I have made on insects for a series of years, (in pursuing the cultivation of plants,) to consider the *Aphis* as by far the most general cause of the diseases distinguished by the name of Blights. Other insects, it is true, more especially the *larvæ* of some of the *Lepidoptera*, as those of the *Phalænæ Tortices*, disfigure and do infinite mischief to plants, by rolling and curling up the leaves. But these, for the most part, confine themselves to certain trees and plants. Their ravages are also of shorter duration, being confined to the growth of one brood, and they are also less fatal. It would be no difficult matter for me to fill a volume with observations, to which I have been an eye-witness, of the injuries which plants sustain from insects ; but that would be foreign to my present purpose, which is to show, that the *Aphis* is the grand cause of these diseases, and to place the *modus operandi*, or the manner in

which they effect this business, in its true light,

We are fully aware, that certain gregarious insects may, at particular times, rise up in the air, and, if small and light, be impelled by any wind that may chance to blow at the time; and on this principle we account for that shower of *Aphides* described by Mr. White to have fallen at Selborn. But certainly this is not the mode in which those insects are usually dispersed over a country. The phænomenon is too unusual, the distribution would be too partial; for *Aphides*, while at their highest point of multiplication, do not swarm like bees or ants, and fly off or emigrate in large bodies, but each male or female *Aphis*, at such periods as they arrive at maturity, marches or flies off without waiting for any other. Yet it may happen that, from a tree or plant thickly beset with them, numbers may fly off or emigrate together, being arrived at maturity at the same moment of time.

Detaching itself from the plant, each pursues a different route, intent on the great business of multiplying its species, and settles on

such plants in the vicinity as are calculated to afford nourishment to its young.

The common green *Aphis*, which is so generally destructive, lives during the winter season on such herbaceous plants as it remained on during the autumn, either in its egg or perfect state. If the weather be mild, it multiplies greatly on such herbage; as the spring advances, in May the males and females of these insects acquire wings: and thus the business of increase, hitherto confined, is widely and rapidly extended, as the winged *Aphides*, by hop-planters called the Fly, may be seen from this period very generally sitting on plants, and floating in the air in all directions.

The *Aphis Salicis* is among the largest English species, and is found on the bark both of the trunk and the branches of the *Salix Triandra*, *Fragilis*, and *Viminalis*, but mostly on the last. The bodies of these insects contain a red liquid, and hence persons employed in stripping osiers have their hands rendered apparently bloody, by unavoidably bruising them.

Near the end of September, multitudes of the full-grown insects of this species, both winged and others, are observed to desert the willows on which they feed, and to ramble solitarily over every neighbouring object, in such numbers, that we can handle nothing in their vicinity without crushing some of them. Are they retreating to fresh trees, on which to deposit their young, or seeking some warmer situation for the winter season? Vast numbers of them, mostly in a younger state, still remain in large masses on the trees.

Though numberless insects, wasps in particular, were devouring the sweets they deposited, the Lady-bird, (*Coccinella*,) was the only one that preyed upon the *Aphides* themselves; and those, towards the end of the month, began to relax their depredations, and to retreat to their winter quarters.

As the season advances, the *Aphides* are found higher on the trees, proceeding gradually upwards in quest of new food. When the young *Aphis* is brought forth, and is completely disengaged, it insinuates itself under the body of its mother, and places itself close to its elder brother or sister, thus early mani-

festing an attachment to that congregated state of society in which it afterwards exists.

If, by striking it, you jar the branch of the tree on which the *Aphides* are placed, or should a wasp, or other large insect, approach them suddenly or rudely, the whole of them, as it were in a mass, elevate their bodies and hind legs, and put them in motion ; and herein appear to consist their whole powers of defence : in this state their very fine white legs, thus elevated, give them a curious filamentous appearance. We have frequently observed white incrustations adhering to different parts of their legs, wings, and bodies. Towards the middle of October, many pregnant females were observed emigrating from the mass. Upon opening the abdomen, in the month of November, of one of the largest females, I counted sixty young, large and small.

## ESSAY V.

*On the Sea Weed of the Island of Jersey.*

THE plant named *le varech*, “*quercus marina*,” in English, sea ware, or weed, or wreck, is one of the most valuable plants for the purposes of Agriculture. Without it, great part of our lands would remain uncultivated, or would yield very scanty crops. We have made use of it time immemorial, convinced of its utility. The major part of our labourers lay aside all other occupations, to procure it at the time of cutting it. The varech is considered of so much importance by the legislature, that they have regulated its distribution amongst the inhabitants, and appointed officers to attend to its preservation. It is only permitted to cut it at two periods of the year. The first cutting is in the months of February and March, and serves as manure for pasture land, nurserymen’s grounds, and fields sowed with barley. It is not decided upon what ground it suits best. It gives a surprising power of vegetation to plants in every kind of soil. Two cart loads, weighing

two thousand pounds each, with six carts of stable dung, sufficiently manure a *vergée* of land of 1000 feet square.

The second cutting of the varech is in the month of July; it is then laid to dry on the sea-shore, after which it is collected and housed for winter's fuel.

Exclusive of these two cuttings according to law, it is gathered at all seasons on the sea coast, by people who pick up what the sea throws up. They dry it on the spot where it is gathered; and though it is inferior to that which is cut, it meets with as certain sale; in a word, the varech is the cause that we scarcely ever have any poor amongst the country people.

The chimnies in which it is consumed, are much larger than for coal, and are furnished at different distances, from six to ten feet, with strong iron bars, to which are suspended pork lately salted, which is fumigated during three weeks or a month, after which it is deposited in a dry place for use. By this method it acquires a peculiar flavour and taste, superior to other pork smoked by means of coal or wood.

It may be preserved during the whole year, and longer. They also smoke beef and fish in the same manner.

The ashes of the varech (alkali mixed with marine salt) make an excellent manure, particularly for stiff soils. It is judged that a cabot (half a bushel) strewed over a perch of land, in the winter season, or at the beginning of spring, will be a sufficient manure. Our labourers are unanimous in opinion, that it gives a full ear to the corn, and prevents its being laid. In proof of the esteem in which the varech is held, although the island do not furnish above half the quantity of corn wanted for its consumption, those who have any verech to sell, may, at all times, get a cabot of wheat, for a *quartier*, or six bushels of verech.

We must not forget to add, on the subject of the varech, that it is generally agreed upon, that what is laid on the soil, by way of manure, has no effect on the ensuing crop, after that for which it is intended. This fact has been acknowledged by the major part of the farmers who have used it, without investigating the reason thereof. This interesting object now engages our attention. We have

supposed that the varech is composed of parts extremely volatile. It was of consequence to impede its too quick evaporation ; we knew that several other matters evaporate entirely when exposed to the air, such as camphor, &c. but when they were amalgamated with other ingredients, they retained longer their original principles. On these grounds, one of our members has collected a quantity of varech, which he has mixed with other manure, arranged alternately, *stratum super stratum*, which, after having undergone a complete putrefaction, adhere, penetrate, and, in a manner, assimilate themselves with the volatile parts of the varech, to such a degree, that this compost, instead of having merely an annual effect upon the productions of the soil, yields a manure for several years following. Unfortunately this process, and mode of using the varech, is not generally followed, either from want of being known, or perhaps because old customs, to which our good farmers pay great respect, are different from it.

## ESSAY VI.

*On Calcareous Earth, its various Compounds, and their application in Agriculture as Manures.*

THE pursuits of philosophy and natural history, furnish an innocent and amusing exercise to the faculties of the human mind. With mere amusement, however, we are not to rest satisfied: the claims of society forbid it: our exertions should not only be *active* but *benevolent*; and the philosopher in his study should remember that he is still a citizen of the world.

Though I am persuaded that the application of Agricultural improvements must ultimately rest with farmers of the lower class, as constituting the most numerous body of men; yet, for the discovery of these improvements, we naturally look up to men of superior information. Gentlemen engaged in Agriculture, who have enjoyed the advantages of a good education, and practical farmers of an inquisitive turn, are frequently desirous of becoming

acquainted with those branches of science which are intimately connected with their favourite pursuit. The acquisition of such knowledge will naturally lead them to reason and think upon agriculture. Not content with viewing the appearances of Nature, they will inquire into that combination of causes, from whence these phænomena are deducible. This leads to experiment, and after all we must acknowledge that *experiment is the proper foundation of agriculture.*

A philosophical and practical history of manures is much wanted. Such a work would be highly serviceable to the gentleman-farmer, who has money at command for the purchase of manures, but is ignorant of their qualities, and proper application. The outlines might be sketched, and circulated through the different counties for receiving information. From such a general mass of intelligence, a general history, philosophical and practical, might be selected.

Viewing the pursuits of agriculture, in the light of an experimental inquiry, a knowledge of the materials, used in these experiments, is certainly of great importance: such elemen-

tary instruction would constitute a useful preparation for practical agriculture. At present we have no book on this subject, to which the inquisitive agriculturist might be referred. Different districts are in the habit of using different manures, and perhaps it is in the neighbourhood of London alone, that a comprehensive list could be obtained. A frequent repetition of experiments is necessary to establish the character of a manure; it is of consequence, therefore, that what is already known on this subject, should be communicated to the public. From the testimony of a number of individuals, facts may be collected and truths established, which we can now only suspect, or suggest, as matter of inquiry. Age frequently disables from active exertions before a man acquires that knowledge which is necessary to characterize an experienced and enlightened agriculturist. The tedious routine of experiment would be contracted, could we but know what facts have been already ascertained. Hence appears the propriety of *a national experimental farm*. Soon, I flatter myself, the opponents of the Board of Agriculture, will be convinced of the propriety of its establishment. From the characters selected, we have every reason to be-

lieve that the confidence of the nation will not be misplaced. A general circulation of agricultural knowledge, could it be obtained by their exertions, would sufficiently prove the usefulness of the institution.

The science of mineralogy, as comprehending the natural history of those bodies with which the farmer is daily conversant, must certainly be a very desirable acquisition. It includes the study of some of our most important manures, such as chalk, marl, and lime. Without going into the chemical analysis of that variety of fossils which nature presents to our view, I shall confine myself only to those which are of use in agriculture, as being connected with the cultivation of the earth. These substances being almost all included under the article of calcareous earth, it will be unnecessary to enumerate the different fossils which belong to the other classes.

The *surface* of the globe is generally covered with a layer of mould; the vegetable soil, or the staple of the earth, as it is commonly called. This is a compound of clay, sand, and putrid vegetable and animal substances; according to the different depths of which,

may be estimated the richness or sterility of land. We observe, on penetrating the *bowels* of the earth, that it is either formed into beds or layers, parallel to each other, or into masses enormous in their size, but regular in their thickness and internal structure. The first has been called strata, the second rock, or rock-stone.

In stratified matter, the thickness and number of strata are generally the same throughout the whole mass, which enables the workmen, after sinking a shaft into a mine, easily to ascertain the materials they must pass through, if they sink another at a considerable distance.

All the varieties of earths, however, which are found in strata, rocks, or detached pieces, are considered, by modern mineralogists, as reducible to the following five :

The calcareous;—the ponderous, or heavy earth;—the magnesian, or muriatic; the argillaceous;—the siliceous.

### *The Calcareous Earth.*

Earths of the calcareous kind have the following properties common to them all :

1st, They become friable when burnt in the fire, and afterwards fall into a white powder.

2d, Their falling into powder is promoted, if, after being burnt, they are thrown into water, whereby a strong heat arises, and a partial solution.

3d, They cannot be melted by themselves into glass in a close fire;

4th, When burnt, they augment the causticity of pot-ashes.

5th, They are dissolved in acids with effervescence.

The calcareous earth is found,

1st, Pure, in the form of powder, and called *lac lunæ*. This is of a white colour, and is found in moors, at the bottom of lakes, and in the fissures of free-stone-quarries, in Oxfordshire and Northamptonshire. In Sweden the colour varies to red and yellow. This is supposed to be lime-stone, washed from the rock, and pulverized by the motion of the water,

It is found in quantities too small to admit of any application to agriculture.

2d, Calcareous earth is found friable and compact, in the form of *chalk*. The white chalk is the purest, yet it contains a little siliceous, and about 2 per cent. of argillaceous earth. There is more fixed air in chalk, than in any other calcareous earth, generally about 40 per cent.

#### *On Chalk, as a Manure.*

The use of chalk, as a manure, has been universally acknowledged, though the effects are various, which have been ascribed to its operation. Farmers frequently talk of it as an unctuous and oily matter, and from these properties have supposed it to enrich the earth.

From its chemical analysis, however, we learn that this is impossible, as no oil enters into its composition.

Its action is either chemical or mechanical.

It acts chemically as an absorbent, contributing to preserve dry those lands which

are poachy and wet; and, by its attraction for acids, it may hasten the putrefaction of vegetables.

It acts mechanically by entering into the composition and totally altering the nature of clay, converting it, by proper pulverization, into a species of marl; by insinuating itself between the particles of clay, it destroys their adhesion, thus preventing it from becoming too hard in summer, and too wet in winter, the water more readily sinking through its pores: the clay being kept in this porous state, yields easily to the growing roots of plants, and more readily admits the manure to the vegetating grain. Hence we should suppose that chalk ought to become a constituent part of all manures. We should conclude its action to be most beneficial on clay and loam, as it can incorporate more readily with these than with gravel or sand. Experience warrants this conclusion, as it is observed by Mr. Young, that the same chalk which answers so well on the rich loams about Enfield, is found of no service in the neighbourhood of North Mims, where the soil is a hungry gravel. When united to clay it gives friability to the com-

pound, hence marl readily falls down in water.

3d, Calcareous earth is found indurated or hard, in the form of *limestone*, which contains a small quantity of quartz and argillaceous earth. To this class belong the Portland and Purbeck stones. They all effervesce with acids, the fixed air entering largely into their composition. They will not give fire with steel. They are found to contain a small quantity of iron. Mr. Kirwan observes, that in a stone found near Bath, the calcareous earth may be detected uncombined with fixed air, which is proved by adding sulphur to a solution of the calcareous earth in water, and applying heat to the mixture. The sulphur is dissolved, and a calcareous liver of sulphur formed: The solubility of the earth in water, likewise proves the absence of fixed air. An infinite variety of substances belong to this class, which are all reducible to lime, by the application of heat.

Opaque lime-stones, of a close grain, and susceptible of a good polish, are called marbles. The black colour of these is commonly owing to a slight mixture of iron. Bergman observes, that all calcareous stones, which grow black

or brown by calcination, may be suspected to contain manganese; in that case, the lime they form is excellent as a cement: and, according to Rinman, white calcareous stones, that grow black by calcination, contain about 10 per cent. of iron. The same author asserts, that blue and green marbles derive their colour from a mixture of shorl.

Lime-stone spars are found chrystallized in various forms,—rhomboidal, hexangular, triangular, &c.; but the most common is the rhomboidal, of which sort is the Iceland chrystral, which possesses a double refracting power. These spars are found of a variety of colours, from a mixture of metallic particles.

The shells of all crustaceous animals, from the coarsest to the coral and the pearl, are all composed of this earth. An animal oil is contained in the various species of lithophyta.

#### *On Quick-Lime.*

Quick-lime has the following properties:

1st, It is entirely soluble in water, with

which it unites so rapidly, as to occasion considerable heat. When exposed to the air, it imbibes moisture. When united with so much water as is sufficient to make it a fluid paste, it is called *slaked lime*. Quick-lime dissolves in water, in the proportion of about five grains to a pint. Water, saturated with quick-lime, is called *lime-water*. Lime-water, being exposed to the atmosphere, attracts from thence particles of fixed air, which float in it; by which means, the quick-lime is rendered mild and insoluble in water, and therefore appears on the surface of the lime-water, or of the slaked lime, where this combination happens, in the state of mild calcareous earth, convertable, by a second calcination, into quick-lime, and is called the *cream of lime*.

2d, Quick-lime unites with acids, without effervescence; it nevertheless saturates as much acid as it would if it had not been calcined.

3d, Quick-lime is disposed to unite with sulphur, with which it forms a *hepar sulphuris*, similar to that made by sulphur united with an alkali. It is also disposed to unite with oils, and with animal and vegetable matters; with

respect to which it discovers a caustic and corrosive property.

4th, Quick-lime, when mixed with sand, forms a mass which hardens, and is used as a cement, or mortar.

5th, Fixed and volatile alkalis, treated with quick-lime, become deliquescent, caustic, and capable of acting like solvents on many bodies, especially those of an oily nature, with much more force and activity than in their ordinary state. Quick-lime by thus communicating causticity to alkalis, loses its own causticity, and acquires all the properties of uncalcined calcareous earth.

Quick-lime and its solution, lime-water, have not only the taste of acrimony, but likewise all the other properties of fixed alkalis. Thus quick-lime changes the blue colour of flowers to green, precipitates all metallic solutions, and even some salts, with earthy basis, such as alum, and decomposes ammoniacal salts, from which it disengages the volatile alkali.

These alkaline saline properties distinguish

quick-lime from uncalcined calcareous earth; which, however, in a very small degree, possessed some of the same properties.

*On the Action of Lime as a Manure.*

From the binding quality of lime, may be explained its beneficial action on sandy land, to which it has been applied, as a manure, with great success. But it has been particularly useful, when these lands are first broke up, in their state of health. The vegetable matter is here acted upon, and reduced to manure, by the corrosive power of the lime. On such lands, when thus treated, I have known the first crop of rye more than repay the expenses.

Its action on clay may be similar to that of chalk.

By its attraction for water, it renders the land dry.

By insinuating itself between the particles of clay, it destroys their adhesion, breaks the stiffness of soil, and gives readier access to the operation of manures, and to the extension of the growing roots of plants.

By its attraction for fixed air, water, and acids, and by its corrosive properties, it destroys the texture of bodies, and reduces vegetable matter to a state of manure. It unites strongly with oils, and renders them miscible with water.

By being destructive to insects and vermin, it may contribute to preserve the springing corn from their ravages.

The action of lime, however, is still involved in considerable difficulties, and the cause of its frequent failure, is by no means easy to be explained. The success of lime as a manure, in the northern and midland counties, where coals are cheap, and the lime obtained from a hard lime-stone, far exceeds what we experience in Middlesex, where chalk alone is used, and the degree of heat applied, there is reason to believe, comparatively weak. My bailiff, who once lived in the neighbourhood of the Staffordshire lime-kilns, has observed, that the Middlesex lime has less sharpness to the taste, than what he has been used to in his own country.

Much, doubtless, may be owing to the state

of the land when the manure is laid on; as lime has frequently been found to be injurious; where land has been forced by repeated corn crops. It, however, appears to be of considerable consequence, that lime should be applied immediately from the kiln, if possible; as, from its attraction for fixed air, when exposed to the atmosphere, it will return to a state of mild calcareous earth. The injury which lime sustains from this exposure, is not so great as is generally imagined, as it must be observed, that the air which lime attracts, is different from common atmospherical air.

Lime-water may be preserved long in a bottle that is but slightly corked, which proves that the lime-water does not attract the whole of the air in the bottle, but only a small quantity of fixed air united with it. But when exposed to the open air, as the air next its surface is continually changing and bringing more of that air to the lime-water, which it is disposed to attract, it becomes at length completely saturated with it.

When a piece of lime-stone is exposed to the air, the consequence which follows, can be easily explained on the same principles.

It becomes gradually less and less soluble in water; and, after a long time, it is restored to its original state. If it is a hard lime-stone, the parts will not unite again, to form a hard mass, but the powder is mild, and appears to have all the other properties of crude lime-stone, broke down into a fine powder. This must necessarily happen, from its absorbing particles of water and fixed air within the sphere of its attraction

From hence may be inferred, the importance of covering lime with earth, to preserve it from the air and rain, if the farmer is obliged to lay it in a heap for any considerable length of time.

Lime is frequently spread, to the amount of a bushel to every pole, or 160 bushels per acre; in some countries, however, only half the quantity is allowed.

It has been observed, that the benefit of lime has not been perceived in a dry summer; and that it does not act as a manure till it has been thoroughly slaked in the soil by continued rains.

In Essex an excellent practice prevails of forming a compost of lime, turf, and ditch-earth, at the gate of every field, ready to be applied as a manure.

Lime and chalk are apt to subside beyond the depth of the common furrow: deep ploughing, in this case, is the only remedy applicable; and when recovered, it can act only as a mild calcareous earth.

Twenty bushels of lime, mixed with forty bushels of sand, form an excellent top-dressing for an acre of wheat, if laid on early in the spring.

The good effects of powdered lime-stone, or lime-stone gravel, as used in Ireland and in the north of England, give some reason to suspect, that the burning of calcareous earth may be chiefly useful in reducing it to a powder, and that calcination is not necessary to its becoming a manure.

Mons. Du Hamel supported this opinion from having accidentally observed the good effects of powdered marble on a lawn of grass near his house, where a stone-mason had been

at work. Repeated experiments alone can decide the comparative value of lime-stone and quick-lime. The materials used should come from the same pit. The land, if possible, should be confined to the same field, and the experiments made at the same season of the year, that the influences of the atmosphere, the nature of the soil, and its state of exhaustion, may be similar. The quantity and value of the materials used should be accurately stated, and the effects watched through two or three successive crops, that the *duration* of the manure may be ascertained.

I have just allotted three acres of wheat land to an experiment on the comparative value of lime, chalk, and dung; the soil, a stiff loam, on a clayey bottom. The field bore this year a crop of grey pease, and the preceding year had produced above three quarters and a half per acre of wheat. The lime and chalk will both be drawn from the same pit, and will be laid on in the following quantities:—Of the lime, 160 bushels per acre, at 6d. delivered; expense 4l. Of the chalk, 80 loads per acre, at 6s. per load delivered; the expense 9l. Of the dung, 12 loads per acre, at 9s. de-

livered; the expense 5l. 8s. The distance of the lime, chalk, and dung, about three miles carriage. The land will be ploughed three times, and the wheat got in, as nearly as possible, at the same time. The result of the experiment I intend watching through three successive crops, before I form any conclusion respecting the specific value of each manure.

4th, Calcareous earth is found united with the vitriolic acid, in the form of gypsum, selenite, or plaster of Paris. It does not effervesce with acids, and is, with difficulty, soluble in any. When heated a little below ignition, it undergoes a motion similar to that of ebullition, from the dissipation of its aqueous parts, and falls into powder. If taken up, when this motion ceases, and sprinkled over with water, it soon concretes, and hardens by reason of its sudden crystallization.

This property of becoming hard and compact, differs from that of quick-lime, which will not unite into a hard mass, without the addition of sand or cement. It has been applied to a variety of purposes; as nothing can be more convenient than a stone which, in its

soft state, is capable of receiving impressions which it afterwards preserves for years.

Mr. Margraaf observes, that gypsum is entirely soluble in water, and that it may be artificially composed by saturating the vitriolic acid with the calcareous earth.

Mr. Macquer asserts that the hardness of water is owing to gypseous selenites, which are dissolved in it.

Gypsum has lately been extolled in several of the foreign publications, as a manure of the highest value, particularly in America; where, according to Mr. Chancellor Livingston, it has created a new æra in agriculture \*.

The experiments, however, which have been repeated in England, on this manure, are by no means decisive in its favour. Sir Richard Sutton and others have tried it, to the amount of six bushels per acre, the quantity recommended, without having been able to trace its good effects.

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\* Vid. *Annals of Agriculture*, vol. xx. p. 75.

Mr. Proctor Anderdon, of Henlade, Somersetshire, concludes, from some experiments\*, "that on many plants, or in many soils, gypsum powder will have no effect; but that it has some effect on old clover, on a loamy soil; and that a greater effect may reasonably be expected from it, when applied to younger plants of the same sort or nature."

Clover is the crop supposed to have been principally benefitted by it. Calcareous earth is generally acknowledged to be favourable to the growth of clover, but the addition of the vitriolic acid, a suspected poison in agriculture, would naturally have induced the agricultural chemist to have rejected gypsum as a manure: theory, however, must never be opposed to experiment; but the soundest philosophy allows us to repeat with care, and to watch with caution, experiments which contradict generally received truths.

5th, Calcareous earth is found united with clay in the form of marl.

Marls are of three kinds,—shell-marl, clay-marl, and stoney-marl.

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\* *Annals*, vol. xvii. p. 297.

Shell-marl is composed of the shells of shell-fish and other aquatic animals, which are sometimes very entire, and often united with other earthly substances. This may be distinguished into fresh water-marl, and the marl of sea-shells; but these, having no clay in their composition, cannot properly be denominated marls.

Clay-marls are earths which bear more or less resemblance to clay; they vary both in colour and other appearances, and agree only in containing a quantity of clay mixed with calcareous earth.

The stoney-marls are harder and more stoney than the clay-marls; but, upon being exposed to the action of the sun and of frost, they fall down into clay, which is easily mixed with the soil.

All these marls effervesce with acids; but as water alone will frequently force a quantity of air from pure clay, when in a dry state, which may occasion it to be mistaken for marl, it will be proper, in trying bodies suspected to be marls, to let them stand a short time in water before they are submitted to the

test of acids. For want of properly attending to this, Dr. Black, of Edinburgh, remarks, that he had frequently received earths, supposed to be marls, which, on a strict examination, proved to be pure clay.

Marls are fusible in the fire, as are all mixtures of these two earths. By less heat, if the calcareous earth predominates, they are calcinable into a kind of quick-lime; and if the clay prevails, they may be changed by fire into hard masses, capable of striking sparks from steel.

Some authors, as Dr. Hill, comprehend under this name, earths, which contain no calcareous particles, and which are altogether argillaceous. But the word is more properly confined to such compounds as consist of clay and calcareous earth; sand mica, and other earths, may, however, be occasionally intermixed. The calcareous and argillaceous earths differ much in their proportions; hence a diversity in the appearance and properties of marls: the richest marls are found to contain the largest proportion of calcareous earth; hence arises the importance of ascertaining this proportion, in order to decide on the value of

marls. The following method is proposed by Dr. Black: calcareous earth generally contains 40 per cent. of fixed air; upon this circumstance the experiment is founded. By saturating the marl with an acid, and by observing the loss of weight the earth sustains, when the air is expelled, we learn the proportion of calcareous earth which it contains.

Put two hundred grains of marl into a vessel, add a little water, and saturate it with an acid, observe the loss of weight, if it loses forty grains, there are then one hundred grains of calcareous earth in the marl, the loss of weight which it suffers being always about 40 per cent. of the whole, or 42 at most. Some marls contain only one-twentieth, or even one-thirtieth part of their weight in calcareous matter; a farmer, therefore, by knowing the value of a marl, can judge whether it would not answer better to fetch chalk and lime from a greater distance, and at a higher price.

The quantity of calcareous earth, contained in marls, may likewise be discovered by solution and precipitation. Let the acid of sea-

salt be gradually added to any given quantity of marl, till no further effervescence ensues upon the addition; dilute the liquor with water, and pour it into a *filtre* of grey paper; a pure pellucid liquor passes through, and an earthy substance remains behind at the bottom of the *filtre*; this will be found to be clay, combined with a small portion of sand, and sometimes with flakes of mica; add to the pellucid liquor a solution of salt of tartar, the liquor will become turbid, but will recover its transparency by a copious precipitation of a white powder; let the alkaline solution be again added and repeated, until no such appearances take place; the powder, thus precipitated from the acid solution, will be the calcareous earth contained in the marl; and when separated by filtration, washed and dried, gives what the clay wanted to complete the original weight of the marl. Marls differ from other calcareous bodies, in readily falling down into powder, when exposed to the air; this appears to be owing to the clay, which penetrates the substance of the marl, and prevents the contact and adhesion of the calcareous particles.

Marl is much used in agriculture, to give fertility to soils; great benefit has been derived

from its application to the poor sands of Norfolk, where, fortunately, a stratum of marl is found immediately below the sand. It has been laid on, in many places, at an immense expense, from twenty to sixty loads per acre; its duration, as a manure, has been found to be great, but its effects last the longest on a stiff soil. Marl has been asserted to clean lands, by proving destructive to weeds. It has been found to form an excellent compost with yard dung.

Marl, in common with all absorbent earths, has a strong attraction for oils; hence it may attract and fix the oils which it meets with in the ground. Of all other manures, this seems to be the most favourable to the growth of the white clover, which spreads itself luxuriantly where the land has been plentifully dressed with marl. Some are of opinion, that marl, instead of acting as a manure itself, reduces the soil to that state which is most favourable to the action of other manures.

#### *The Origin of Calcareous Earth.*

There is great reason to believe that this earth derives its origin from the calcareous

matter of shells and lithophyta: relicts of these are found in by far the greatest number of lime-stones and chalks, and those of the finer lime-stones, called marbles. They frequently constitute an entire mass of madrepores and corallines.

The Portland stone consists of round grains united together, which were supposed to be produced from the spawn of fish, but it is plain that they arise from calcareous sand. By a constant agitation, the softer parts are abraded, and the harder parts remain in the form of small particles, which are highly polished, and which are afterwards made to concrete together, by causes of which at present we have no knowledge.

If we should find it difficult to conceive how such immense masses can derive their origin from shells, we should consider that the various species of corallines are a fruitful source of this kind of earth.

We learn, from the history of a ship sunk in a storm, in the gulph of Mexico, how immense must be the growth of these bodies. About thirty years after the vessel had been

wrecked, they attempted to dive into it to search for a quantity of silver, but they found great difficulty in getting it, from the ship's being overgrown with coral. Sir Hans Sloane, in his natural history of Jamaica, observes, that the ship-timbers, the iron, and the money, were all concreted by the growth of the calcareous matter. The quantity of matter thus produced must be immense, when we consider the prodigious extent of surface which the bottom of the ocean affords for its production.

## ESSAY VII.

*On his Majesty's Farm upon Windsor Forest.*

IN the year 1791, the Great Park at Windsor, about 4000 acres, fell into his Majesty's possession. It might truly be called a rough jewel. The whole, as a natural object, was grand and beautiful, of a forest appearance; but the parts were crowded and indistinct. The soil was various, some parts clay and loam, and some sharp gravel or poor sand; a great part of the former was covered with rushes and molehills, and the latter with fern and moss.

About 1000 acres of the lightest part was separated from the rest at one extremity, and formed what is called the Norfolk Farm; about 400 acres more, at the other extremity, of a good loamy soil, were separated, and called the Flemish Farm, both being named from the nature of the husbandry meant to be adopted upon them.

The rest (about 2400 acres) remains still in

plantations and park ; and though so much reduced, yet, from the improvements which have been made upon it, is now capable of carrying more stock than the whole 4000 acres did before. All the unsound wet parts have been drained by the Essex mode, so as to be rendered firm, and productive of an improved herbage. The molehills have been levelled, chiefly by dragging, and the coarse and mossy parts fined by repeated harrowing and rolling ; (being one of the first improvements upon park land of this description;) besides which, a variety of beauty has been laid open, by clearing the valleys and low parts, to give a bolder effect to the woody scenes upon the higher ground ; and by making judicious openings, so as to break strait lines, and separate parts that were in some places too heavy and samely : so that the same extent of land has now not only a much larger appearance, but exhibits a much greater variety of ground. The truth of this, every impartial person who knew the place before his Majesty caused these improvements to be made, must allow. I have only to add, that though prejudice may have taken up an idea that there has been too great a sacrifice of timber in effecting these improvements, truth will deny it. There has not been

a tree cut down, but what was either in decay; or removed either to give room for the growth of others, or to set them off to greater advantage in picturesque appearance.

I come now to the object in view, as before hinted, which is to state the motives which I am inclined to think induced his Majesty to adopt the farming system upon so large a scale, and next to show the result. These, I conceive, were chiefly to create useful labour to the industrious poor in the neighbourhood, and for trying experiments in Agriculture, to excite imitation where success might encourage it.

The Norfolk Farm borders on that extensive waste called Bagshot-heath, hitherto considered too barren for cultivation, though large tracts of a similar quality have been long since rendered useful to the community in the south-west part of Norfolk. Arable land of this description is generally managed there under a five-course shift; first, wheat; second, turnips; third, barley with seeds, which continue laid two years. But as the seeds turn to very little account after the first year, his Majesty's, which though a five-course shift

likewise, of one hundred acres in a shift, is upon a much improved course of cropping; as thus—first, wheat or rye; second, the irregular shift; third, turnips; fourth, barley or oats; fifth, clover.—The irregular shift, which is of great use on a light land farm, may perhaps want a little explanation. It is meant to be partly productive, and partly preparative. Forty acres of it are sown with vetches, to be fed off; forty are sown the latter end of August with rye, for early feed the next spring for the ewes and lambs; the remaining twenty acres are planted with potatoes, and the whole comes round for turnips the next year.

From the advantage of running sheep in the Park, this Farm has been brought surprisingly forward, considering the short time it has been cultivated; and a great part of it, which produced nothing but heath and moss, and would have been dear at five shillings an acre, to rent, now produces crops worth more than the original fee-simple of the land.

Brevity checks me from going farther into a general description; but the following particulars may deserve notice.

The comparative advantages of the labour of horses and oxen, have been for some time under the consideration of the public. His Majesty has unquestionably tried the latter upon a larger scale than any other person, as he does not work less than one hundred and eighty oxen upon his different farms, parks, and gardens, and has found them to answer so well, that there is not now a horse kept.—Upon the two farms, and the great park, two hundred are kept, including those coming on and going off. Forty are bought in every year, rising three years, and are kept as succession oxen in the Park; one hundred and twenty are under work; and forty every year are fatted off, rising seven years.

The working oxen are mostly divided into teams of six, and one of the number is every day rested, so that no ox works more than five days out of the seven.—This day of ease in every week, besides Sunday, is of great advantage to the animal, as he is found to do better with ordinary keep and moderate labour, than he would do with high keep and harder labour. In short, this is the first secret to learn concerning him; for an ox will not admit of being kept in condition like a horse,

artificially, by proportionate food to proportionate labour.

These Oxen are never allowed any corn, as it would prevent their fatting so kindly afterwards. Their food, in summer, is only a few vetches, by way of a bait, and the run of coarse meadows, or what are called leasows, being rough woody pastures. In winter they have nothing but cut food, consisting of two-thirds hay, and one-third wheat-straw; and the quantity they eat in twenty-four hours is about twenty-four pounds of hay and twelve of straw; and on the days of rest, they range as they like in the straw-yards: For it is to be observed, that they are not confined to hot stables, but have open sheds, under which they eat their cut provender, and are generally left to their choice to go in and out. Under this management, as four oxen generally plough an acre a day, and do other work in proportion, there can be no doubt but their advantage is very great over horses, and the result to the public highly beneficial.

The oxen which are brought on in succession, run the first summer in the Park; and in the leasows and temporary straw-yards in

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the winter; by which temporary straw-yards, I would have it understood, that they are made in different places, so that the manure which they make may be as near to the spot where it is wanted as possible.

The forty oxen which go off, are summered in the best pasture, and finished with turnips the ensuing winter.—The usual way has been to draw the turnips, and to give them either stalled or in cribs placed in the yard, with plenty of straw to browse and lie upon. But last winter an experiment was tried, which answered extremely well, and will be again repeated next winter: this was, penning the oxen by day upon the turnip-land, in the manner that sheep are penned, with this only difference, that the turnips were thrown up into cribs, instead of being left to be trodden into the ground; and in the nights they were driven into a yard, with a temporary shed well littered with rushes, fern, and leaves, and turnips and barley-straw given to them in cribs. They thrived very fast, and every one of them made at least eight loads of good muck in the night-yard, besides the benefit done in treading and dunging on the land in the day-time, which was very great, the soil being very

light.—The result of the Ox system is, that charging the ox for his agistment the first year, for the value of the grass and turnips the last year, and putting what he has in three intermediate years as an equivalent for his labour, after every allowance for risk, each ox will pay at least twenty per cent. profit.—In what instance does a horse produce so much?

I do not allow that the Ox can be used on all soils; upon a very stony soil he cannot: nor can the horse in all places be wholly excluded from husbandry; but every occupier of a large farm may at least use some oxen to very great advantage. They are all worked at Windsor in collars, as their step is found to be much more free than when coupled together with yokes; and they are found to do their work with much greater ease in collars than in yokes, which ought every where to be exploded.

The different kinds of Oxen are in some measure suited to the soil.—Upon the Norfolk Farm, which is a light soil, the Devonshire sort are used; upon the Flemish Farm, where the soil is strong and heavy, the Herefordshire;

and in the Park, where the business is carting, harrowing, and rolling, the Glamorganshire.—They are all excellent in their different stations.

It may not be improper to mention a very simple method which has been discovered, of first training them to the collar, which is nothing more than putting a broad strap round their necks, and fastening one end of a cord to it, and the other to a large log of wood, and letting the ox draw it about as he feeds in his pasture, for three or four days, before he is put into harness, by which means he is very much brought forward in docility.

I have before observed, that twenty per cent. may be considered as the average profit of an Ox; stating them to be bought in at 10l. and allowing them to sell for 25l. taking off 10l. for the two years they are not worked: but the last year beans being of little value, they were kept longer than usual, by being stall-fed with bean-meal, which answered very well, as they were brought to an average of nearly 30l.; and one of them, a Glamorgan-Ox, originally bought for 8l. and from his compact round make, always called the little

ox, thrived to such a surprising degree, that he became too fat to be able to travel to Smithfield, and was therefore sold to Mr. Charlwood, a neighbouring butcher for 47l.

Next to the advantage obtained from Oxen, as much benefit as possible has been endeavoured to be derived from sheep, by means of the fold.—Two ewe flocks are kept, of four hundred each: the soil being light and dry, admits of winter-folding (except when the weather is wet), upon the young clover;—a practice much to be recommended, as it is productive of a great crop of clover, and prepares the land the ensuing autumn for a crop of wheat, without any further assistance. Another excellent practice is folding upon light land, in dry weather, immediately upon the sowing of the wheat, which may be put forward, or kept back, a fortnight or three weeks, on that account; and it is not amiss to have the fold rather large, and to give the sheep a turn or two round the fold in a morning before they are let out, to tread and settle the land, which does a great deal of good, over and above their dung.

A third method of folding has been found

to answer almost beyond description. This was first tried in the winter of 1793; but from an idea of the shepherd, that it injured the sheep, has been since disused: but as there is good reason to believe that there was no just ground for such an opinion, it is meant to be revived next winter.

A dry sheltered spot is selected, and sods of maiden earth, a foot deep, are laid over the space of a very large fold. It is then bedded thinly with rushes, leaves of trees, fern, moss, short straw, or stubble; and in hard or wet weather, the flock, instead of being penned upon the clover in the open fields, is put into this warmer fold, where the usual quantity of hay is given to them in racks; and every night they are so penned, the fold is fresh littered. When this has been continued, at intervals, during the winter, a layer of lime, chalk, rubble, or ashes, six inches thick, is spread over the whole surface, and when it is heated together, about the month of April, the whole is turned up, and mixed together, and makes the very best manure that can be used for turnips.

I have been particular in describing these

methods of folding, as they are not common in any place, and in others entirely unknown, and to gentlemen who have parks and large plantations which afford abundance of leaves, this hint may be the more deserving attention.

Upon the Norfolk Farm, the land not having been yet marled or clayed, the clover is apt sometimes to fail, which is also the case elsewhere, upon the same sort of land. When this happens, his Majesty does what every other person in a similar situation should do; instead of letting the ground remain unproductive, the next year it is sowed with vetches, which are nearly as valuable as the clover, and wheat always grows remarkably kind after them.

As to implements, the Norfolk plough is chiefly what is used; and upon a light soil, it is certainly preferable to any other. It ploughs a cleaner furrow, by completely moving the whole body of earth, and inverts it much better than any other plough; and to establish its superiority over the common ploughs of the neighbourhood, I need only add, that from its construction it is nearly the draught of an ox.

easier. There is likewise a Norfolk harrow, very useful for harrowing what is called Brush-turnips, or any other turnips, preparatory to their being hoed.—I must be allowed, likewise, to mention the drill-roller, which consists of cast-iron rings, made at the Norwich Foundery, and slipt on upon a round piece of wood, as an axle-tree. This is one of the best things that ever has been introduced, for the preparation of the land for any sort of corn, where the soil will admit of its being used. By the corn being so well deposited, it takes better root, and at least one-fourth of the quantity usually sown may be saved.

The Flemish farm, which I have before mentioned, was so named from an intention, at first, of carrying on a system of husbandry similar to that practised in Flanders, which consists of an alternate crop for man and beast; but the soil being strong and cohesive, upon trial, it has been found to answer best under a four-course shift, more like some parts of Gloucestershire; as thus:—First year, wheat; second, cabbage or clover; third, oats; fourth, beans.—The quantity of arable land on this farm is one hundred and sixty acres, or forty acres in a shift. There are two things ob-

served upon this farm, which may be worth notice.—The first is the practice which has, for these two years past, been adopted, by taking off the tops of the beans just as the blossom is set; this not only improves the quality, but increases the quantity, and causes them to ripen sooner, which is a considerable advantage, by giving time to get the succeeding crop of wheat in perhaps a fortnight earlier. The other is, that of sowing clover early in the spring, among twenty acres or one-half of the wheat, and bush-harrowing and rolling it in. This has produced a very fair crop of clover the next year; and the other half, after the wheat, is winter and spring fallowed, and planted with cabbage. There is a double advantage resulting from this; that one-half of this shift, so managed, becomes a summer crop, and the other half a winter crop; and by observing the next year to change the parts, by sowing the clover where the cabbage was before, the clover and cabbage do not come round upon the same ground but once in eight years.

Cabbage has been tried several years, but his Majesty's husbandmen never got into the

right management till this year, but now the crop is remarkably fine.

It will not be improper to mention, that the drum-headed cabbage is the best sort; that the seed should be sown in August, the plants first set out in November, and transplanted for good in July. The next thing to be noted is their application:—They are certainly inferior to turnips for fatting, but superior in the increase of milk, either of cows or ewes, and therefore they are particularly good where there is a dairy or a breeding flock of sheep; and I trust his Majesty will, the next yeaning season, try an experiment, of which I have high expectation, which is to slice or quarter the cabbage, and feed the ewes with them upon such of the meadows as want manuring, which I flatter myself will be of inestimable service to the ewes and lambs, and be the means of increasing the next year's crop of hay considerably.

The true light of viewing these improvements, is to consider them as a sort of new creation to the public: For, as it is a fact not to be controverted, that the reduced number

of acres in the Park, from their improved state, support as many deer and other cattle as the whole did before, the produce obtained from the farms is all clear gain ; and as the crop of wheat and rye from the 140 acres sown, upon the most moderate calculation, may be set at 3360 bushels, and allowing six bushels to a human mouth, this gives a yearly provision in bread for 560 people ; to say nothing of the fatting off of forty oxen, the breed of 800 sheep, and the growth of at least 5000 bushels of oats and beans ; all of which, it must be observed, goes in aid of the public market, as the work is done by oxen entirely.

I shall now close my observations upon his Majesty's farms, with a description of his Mill, which I consider as the most benevolent thing that can be done for the poor, and which I most earnestly recommend to all gentlemen of landed property, who have like means of doing it. A small Over-shot Mill is erected, and worked by the waste water from the lake below the Lodge, where a sufficiency of corn, two-thirds wheat and one-third rye, is ground, dressed, and given to all the labourers, at sixteen-pence per stone of fourteen pounds, in quantities suitable to the size of their families,

which is the first of all comforts to them, and a saving of at least twenty per cent. from what it would cost them to buy it from the mealmen or shopkeepers.

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## ESSAY VIII.

*Experiments and concise Agricultural Observations.*

**T**HIS Essay contains a selection of such Experiments and short Observations as have made their appearance under respectable Signatures. Among them, there are a few Observations that have never before appeared in print.

### 1. *To obtain clean Hay-seeds for laying down land* \*.

The best hay-seeds that can be obtained are those from an old pasture, meadow, or marsh, that is known to abound in good kinds

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\* By Mr. Boyse.

of grass; taking care that the soil, from which the seed is to be saved, is similar to that on which it is to be sown; for this is following Nature, the husbandman's best guide. The field being selected, instead of cutting the grass at the usual time for hay, let it stand until the yellow Oat-grass begins to turn yellow; by which time, as it is one of the latest sorts, all the others will be come to perfection; it may then be mown, and, when fully ripe, thrashed out on a sail-cloth in the field, or carried into the barn, to be thrashed in winter. If thrashed in the field, the straw may be stacked as hay, which will make good fodder for lean cattle.

About four bushels of this seed, after being sifted through a sieve of 12 wires to the inch, with 8lbs. of rib-grass, 4lbs. of white Dutch clover, and 4lbs. of cow-grass seeds, will be sufficient for an acre of land. On chalky and all dry soils, 4lbs. of yellow trefoil-seed should be added.

The seeds should be sown immediately after the corn in the spring, when the land, by harrowing and rolling, should be well pulverized, and left perfectly smooth.

If a good pasture be the grand object, without any view to the last crop of corn, the grass seeds may be sown on a well-made summer fallow, about mid-summer, as soon as the seed is thrashed; after the seeds are well harrowed in, the land should be repeatedly rolled, to make it even for future mowings.

The first year, new-made pastures should be lightly fed with young cattle, in order that the grass may get strength, by which many plants will run to seed, and dropping on the land, will thicken the turf the second summer, when it may be hard stocked with sheep, or mown for hay. If it can be folded or dunged, it will tend greatly to strengthen and improve the turf.

## 2. *A cheap and lasting Paint for Gates, Rails, and Palisades.*

Skimmed Milk, . . .	2 quarts
Fresh slaked lime, . .	8 ounces.
Boiled Linseed Oil, . .	6 ounces.
White Burgundy Pitch, 2	ounces.
Spanish White, . . .	3 pounds.

Slake the lime by dipping it in water, and then expose it to the air till it falls into

powder. Then mix it with the fourth-part of the milk, adding the oil, a little at a time. Stir it well with a wooden spatula, adding the remainder of the milk. Lastly, add the Spanish White. The pitch must be previously dissolved in the oil by a gentle heat. When used, to be laid on (two coats) with a painter's brush. The expense about a half-penny a square yard.

### 3. *On Paring and Burning* \*.

Paring should be done early in spring, and the sod, on cultivated lands, cut, from half an inch to an inch deep ; and on uncultivated lands, from an inch to two inches deep ; and the breadth from nine inches to a foot. The length depends on the toughness of the sward, and the strength of the workman.

If a succession of fine weather ensues, the sods need no removing, until they are put upon heaps to be burned ; but if wet weather ensues, it will be necessary to set them upon their edges, in a semi-circular or angular form, that the wind may blow through them.

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\* By Mr. Greenall.

When the sods are dry, they are laid round locks of straw, or faggots of furze, &c. until they are from three to six in thickness, according to their thickness, and kind of soil they are taken from. Care should be taken to lay the sods, so that a free circulation of air should pass between every one, and that the grafts side be downwards. A hole is left to set fire to the furze, &c. which, as soon as the fire has taken full hold of the sods, should be stopped up, and the fire carefully attended to, and the sods shifted according as the heap burns more on one side than another, which the wind will cause.

#### 4. *On forming Composts* \*.

Too much attention cannot be paid to compost in its several stages and operations. I have found that the difference of the value of compost, properly managed, and that made in a common and negligent way, is to a farmer a very serious consideration. The method of managing compost, which I have practised with profit and success, is as follows: I previously prepare the materials, and according

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\* By Mr. Greenall.

to the quantity of each material, proportion the thickness of each layer, not making any one more than six inches, laying first a layer of one material, and then of another, and so on alternately, gradually decreasing the breadth of the heap, until it be reduced to a point at the top, forming an angle. If the materials are likely to be tardy in beginning to ferment, I put a few lumps of quick-lime into each layer, and beat the sides of the heap with a spade to keep out the weather. I then attend to its fermentation with as much care as a brewer does to his liquor; and the moment I find the heat begins to abate, I turn the heap over, and chop it very fine, and throw the outsides and bottoms into the middle, preserving the same form as before, and again beating the sides to keep out the weather. By turning it while hot, a fermentation takes place in the second heap, and by throwing the outsides and bottom of the first heap into the middle of the second, the whole mass becomes completely putrified; all weeds and extraneous matters are destroyed by the fermentation, and the compost, after it has lain about two months from the last turning, is in a perfect state, presenting a mass of matter, superior as manure, to any other. Keeping the weather out is a

material point; but to keep up the fermentation, until the whole mass has thoroughly partaken of its effects, is the great object to be attended to.

5. *On converting Chalk-Land and Downs into Tillage\**.

To convert grass land on this kind of soil into tillage, is one of the most advantageous improvements in Agriculture, if properly conducted. Old Downs, that are frequently unproductive of any valuable herbage, may, in a very short space of time, and at little expense, be brought to yield the most abundant crops of corn;—of barley, no land whatever produces better crops, nor finer samples, and when put under a proper system of tillage, good wheat may also be obtained.

The method is to pare and burn, in the first instance, a turf as thick as can be cut to burn well; let the burning be finished as soon as possible in the spring, the ashes spread, and the land ploughed three or four inches deep; harrowing and rolling it down smooth immediately after the plough to keep in the moisture. In the last week in June, let it be cross ploughed about five inches deep, to mix

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\* By Mr. Greenall.

the ashes intimately with the mould ; then sow the land with turnips, if a dry season, by drilling, as that mode lets the seed down into the moist earth ; but if the season be rainy, sowing broad-cast will answer the purpose of a quick vegetation nearly as well. The drill system is, however, the best, as it gives a better opportunity of eradicating by the hoe, the seedling weeds, that on these old Downs are generally found ; particularly charlock, than which nothing is more pernicious. Every plant that is left and seen in bloom among the turnips in the autumn, must be drawn out carefully by hand ; as otherwise a little fine weather, in the early part of the winter, will ripen the seed, and a few frosty days after will shake it out on the land, where it will remain to vegetate in future, a plague to the farmer, and destruction to his crops. The turnips must be eaten off by sheep living upon the land night and day, having a quantity set out with hurdles, fresh for them as occasion may require, with a daily allowance of podware or trefoil straw for lean, and hay for fattening, sheep. Some fodder is absolutely necessary, as turnips alone, especially in wet weather, are very unwholesome. To fatten sheep on turnips with oil-cake, is the greatest improvement ; and, how-

ever the farmer may be, in some respects, a loser by feeding sheep in this way, his loss will certainly be repaid tenfold in his future crops of corn. Instances can be brought in proof, of crops of corn being raised by this means, to be worth sixty times the annual rent of the land. After the turnips are consumed, the land should be ploughed about four inches deep as speedily as possible, and sown with barley, and clover-seed. The sooner the land is ploughed after the month of January, provided the land be not very wet at the time of sowing, the more valuable, in general, will be the produce. Every weed that is seen among the barley must be taken out by hand; and if the cultivator has any reason to suppose that there is a great abundance of the seeds of weeds remaining in the soil after the first crop of turnips, a second should be raised the following summer, in order to get the land completely clean before he ventures upon crops of corn.

The crop of clover should be eaten off by sheep laying upon the land, and, if it can be accomplished, the ley may be folded in the end of summer, ploughing it afterwards five inches deep, to be sown with wheat in the month of October, or early in November. Every weed found among the wheat in the month of June,

and early in July, should be carefully taken out by hand ; and, as soon as convenient after harvest, the land should be ploughed about five or six inches deep. The land, having by this rotation produced two stout crops of corn, is entitled to a portion of manure equal to what has arisen from it, which, mixed with mould, will afford a tolerable covering for another crop of turnips. These being eaten in the field as before, the land is left in fine order to be returned into grass, without injury ; indeed so far from injury, these soils will, on the contrary, be highly improved, for every kind of grass, but more particularly for sainfoin ; abundant crops of which I have frequently raised under this management, on lands of this description.

#### 6. *On Hedge-row Planting* \*.

It is to be lamented that in new inclosures very little attention has been paid to raising hedge-row timber, which is done at first with no more expense of fencing than the raising of the quick. There is a general prejudice against trees in hedges, as being supposed to

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\* By Robert Lowe, Esq.

injure the land. Whatever may be the case, with regard to corn, which I apprehend to be much exaggerated, it does not appear to do any harm to grass, and there cannot, in my opinion, be a better or more convenient method, for many purposes, than always to leave a head-land in grass, as may be seen in many parts of Hertfordshire, under the name of hedge-greens. It is obvious that a great quantity of timber may be raised in hedge-rows, which is better for various purposes, than what is raised in woods, particularly compass timber; as knees, crooks, &c.; the most valuable pieces in ship building.

I believe I may venture to affirm, that trees so planted, are likely, in twenty to forty years, to equal the value of the land; whilst in their growth, they have taken up no more land from other purposes.

#### 7. *On the Ruta Baga, or Swedish Turnip\*.*

The Ruta Baga appears to be superior to the common turnip in many respects, particularly in hardness, as it stood the last severe winter without the least injury. It is eat with greedi-

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\* By R. Lowe, Esq.

ness by all animals, from the horse to the swine; sheep prefer it to all others; but the material advantage that is made of it is, the substituting it for corn in the food of draught-horses; in which it has been found to answer the wish of every person who has yet tried it. The turnips are put into a tub, or barrel, and cut small with an instrument like an hoe, with the blade put perpendicularly into the shaft; in one hour a man will cut as much as six horses can eat in twenty-four hours. The tops and bottoms are previously cut off, and given to the pigs. Horses that are hard worked, look full as well when fed with this turnip, and very little hay, as they formerly did when very high fed with corn. The Swedish turnip should be sown early, from the 15th of May, to the 10th of June. Sheep give so decided a preference to the Ruta Baga, that they will not settle upon the common turnip, while the others are to be had,

### 8. *On Irrigation* \*.

In this district, nothing of the kind has ever been attempted; the great advantage, how-

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\* By Edward Wilkinson, Esq.

ever, of water-meadows, determined me to try how far irrigation was practicable on a piece of low ground upon my estate. Notwithstanding the supply of water (from a small brook) was insufficient to float altogether the piece allotted for the experiment, without the assistance of land floods, I determined on the trial, and began the work in August, 1800.

Sensible that the opinion of a professional man was preferable to theoretical information, I applied to Mr. Wright, who has published on water-meadows, for such a person, and he sent me Henry Lock, an intelligent practitioner, from Gloucestershire.

On a view of the premises, he objected to the scantiness of the stream, and doubted the success of the undertaking. Not, however, discouraged, I made him to understand, that the winter rains from many hundred acres would supply a sufficiency of water to irrigate by shifts and breaks, and that our great floods would float the whole at once. On this representation he began the work.

Part of the ground was boggy, and required

draining ; this proved laborious ; for on digging as deep as draining tools could admit, we made no advance. Mr. Elkington's boring rods, however, tapped several springs, and the bog soon became equally sound with the other parts of the meadow. The main delivering and receiving trenches being laid out, water was thrown over the higher part of the work, and continued until further ground was ready for floating. In this manner we proceeded till the whole thirteen acres (all I could command) was under the direction of the floater.

The expense was considerable, owing chiefly to the draining and stubbing of incumbrances. It is with satisfaction I relate, that the improvement has repaid both capital and interest within two years, leaving a permanent rental of four times the former value. The meadow has afforded me this spring excellent pasturage for my ewes and lambs during the month of April, without injuring the crop of hay.

#### 9. *A Compost Dunghill* \*.

Mix one hundred loads of earth with ten chaldrons of lime, about the month of May ;

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\* By Mr. Sikes.

let them lie together till the lime is fallen, but not run to mortar, then turn the heap over. Lay seventy loads of stable dung in a heap close to it. When in high putrid heat, which will be perhaps in four months, lay a layer of this and a layer of earth, two thirds of manure to one of earth, and so go through the hill: turn it over in the spring, and lay it on in March or April. Eight loads to an acre on grass. Another good compost may be prepared by mixing with the above earth and lime, about one third part of the soil from privies and coal-ashes. Upon this plan various composts may be formed,

#### 10. *On the Sweepings of Streets* \*.

The value of this manure is well known to farmers in the neighbourhood of great towns, who pay large sums for it yearly, besides the expense of collecting.

This manure consists of a mixture of all those substances that are valuable in Agriculture, and needs the assistance of fermentation less than any of them to render it fit for use,

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† By Mr. M. Somerville.

as it is made up principally of the offal of houses, dung of horses and cattle, ashes, and other active materials that render it immediately useful.

A farmer in the county of Haddington, who had fallowed a large field, but had not dung enough to manure the whole, sowed it with wheat. In the spring, that part of the field, which had received no manure, was very backward; and though there were plants enough in the ground, yet they were weak and unpromising. By that time he had collected a quantity of street dung from the town of Dunbar, which he applied as a top-dressing upon that part of the field. The effect was astonishing; the wheat immediately began to thrive, and when autumn came, that part which had been dressed in this way, was greatly superior to what had been dunged when the wheat was sown. Top-dressings are the life and soul of husbandry, and cannot be too much attended to.

#### 11. *On Weeding Wheat* \*.

In the month of April, I had a field of wheat that was to appearance smothered by

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\* By Mr. Calvert.

weeds, particularly with what is called hariff, so that very little wheat was to be seen. I ordered it to be harrowed, till I perceived that the harrows drew up more corn than I wished, and still left many weeds; the soil was a light silted land. I then desisted, and employed a number of women to creep over the field, with directions to pluck up every weed, if possible, however small. They obeyed my directions pretty well, which cost me five shillings per acre; and notwithstanding there scarcely appeared any wheat left after the operation, in about three weeks the crop looked well, and became sufficiently productive, yielding nearly four quarters per acre. The wheat weighed sixty five pounds per Winchester bushel. Besides adding very considerably to my crop, I had the satisfaction of seeing the stubble left perfectly clean.

### 12. *On River Weeds* \*.

River weeds have not hitherto been used as a manure, though some experiments that have been made, entitle them to considerable notice. Their effects upon wheat and the different

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\* By Mr. R. Somerville.

sorts of grain, as well as upon turnips, cabbages, and other green crops, are well ascertained, and the facts stated so strong, as to awaken the attention both of farmers and proprietors who have either rivers or lakes upon their lands.

In summer, great quantities may be gathered, both in the lakes and in those parts of the rivers where the water is deep and has no current, and in all wet ditches. This article is used in various ways; sometimes it is laid upon the land green, and ploughed in; at other times it is mixed with earth and dung. Its effects, when ploughed in green, last only one year, but when used as a compost along with other substances, it is more permanent.

The best way of preparing this article for a manure, is to lay it in small heaps for a day or two after it is taken out of the water, in order to drain off the superfluous moisture; for if it contains too much of that, it will not readily ferment, and when fermentation takes place, a considerable portion of its most useful parts will be washed away; having lain two or three days in this state, it should be put into large heaps, containing three or four cart

loads each, and suffered to remain there till the fermentation is over; each heap should then have about three times the quantity of earth or mud mixed therewith, taking care to incorporate them well, and let them remain for a week or ten days; they should then be turned, and a quantity of hot new slackened lime added, during the turning: In this manner a compost may be made ready for use in a month.

This manure seems well adapted for thin light soils, upon which it will always operate well, and from the quantity of rich vegetable earth which it contains, will add something to the staple of the land. Indeed it will be found valuable upon whatever soil it is laid, but should never be used in any other shape than as a top-dressing. By the addition of stable dung, a considerable degree of richness and strength may be obtained, which will render the compost fit for general purposes.

### 13. *On the Tap Root of Oaks* \*.

The tap-root of an Oak plant, of five or six years old, is found to shoot downwards like a

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\* By Mr. Samuel Kilderbee.

carrot; but I am inclined to think, that after a few years it ceases to go on in that direction, and either dies or shoots horizontally. In the autumn of the year, 1795, some hundred Oaks were blown down, from the size of ten, fifteen, and twenty feet, in a tree, to one, two, and three loads and upwards; and upon a close examination, not one was found with an appearance of a tap-root, such as the Oak is commonly supposed to have. Some of those trees stood in open fields, and some in woods, upon various soils, upon clay, loam, sand, and some on marsh grounds: most of the trees were healthy, and many of them had large spreading tops. If then it should be true that the tap-root of an Oak, after a few years, ceases to continue in a direct descending line, (and which, from reason and late observations, against the common opinion, I think it does,) the force of the objection against transplanting may be thought to be greatly lessened.

#### 14. *On the Sweepings of Roads* \*.

In travelling along the road in summer, we are struck with the great quantity of horse

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\* By Mr. R. Somerville.

dung and other excremental matters that we see upon it, and which if carefully swept together and collected, would be found of great value. If the trustees upon all the great roads, were to appoint people to sweep them during dry weather, and to sell the sweepings to the neighbouring farmers, two material benefits would be derived from the practice ; first a valuable Manure would be acquired, which is at present blown away by the winds ; and secondly, an additional sum would arise from the sale of it, for supporting the roads.

If either whin-stone or lime-stone has been used for such roads, the sweepings of them will be a good Manure without any addition, but when this calcareous earth is joined to the excremental matters dropped by horses and cattle, it forms a compost of great value. It is to be hoped, that this part of the subject will in future meet with more attention than it has hitherto done, as we are satisfied that many thousand acres may be manured in this way every year.

Perhaps no Manure can be spread more equally as a top-dressing than this, as its parts are completely separated, and require only a

little attention in laying them on. Along many of the roads in England, immense heaps of this excellent Manure are to be seen, which, if properly employed, would enrich the neighbouring fields.

15. *On the Quickbeam, or Mountain Ash, called in the North, Rowan-tree\*.*

In former times, this tree was supposed to be possessed of the property of driving away witches and evil spirits; and this property is recorded in one of the Stanzas of a very ancient Song, called the “LAIDLEY WORM of Spindlestane-Haughs:”

Their spells were vain. The hags return'd  
To the Queen in sorrowful mood,  
Crying that witches have no power,  
Where there is Rown-tree wood.

The last line of this Song leads to the true reading of a line in Shakspeare's Tragedy of Macbeth. The Sailor's wife, on the witches requesting some chesnuts, hastily answers, “a Rown-tree, witch”; But all the Editions have it “Aroint thee, witch,” which is nonsense, and evidently a corruption.

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\* By A. Hunter, M. D.

This tree will grow upon almost any soil, either strong or light, moist or dry. It will flourish on mountains and in woods, and is never affected by the severity of weather, being extremely hardy. When loaded with fruit, it makes a most delightful appearance :

Sanguineisque inculta rubent aviaria baccis.—VIRG.

#### 16. *On refuse Fish* \*.

All kinds of fish, in a recent state, contain nourishing substances in considerable quantities, and upon particular occasions, either where the quantity caught has been too great for the market, or when there has been a deficiency of salt for curing them, they have been occasionally employed as Manures, even in cases where the fish have been cured; the offal is worth attending to, as it possesses a considerable proportion of nutritive principles; but whether the whole of the fish or only the offal is employed, the management will be the same; both possess too much oil to be useful as manures, without the addition of some active ingredient.

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\* By Mr. Somerville.

The proper way of using fish, seems to be that of mixing them into composts with other substances ; for that purpose, we recommend laying them in heaps for eight or ten days, till they begin to corrupt, and then mixing them with a quantity of earth ; when they have remained in this state for a couple of weeks, the heap should be turned, and a quantity of chalk, or quick lime, added, in the proportion of one cart-load of lime to three of the fish ; this should be allowed to remain for a month, and then turned, and as much earth added as will be equal to both the fish and lime. HERRINGS being the fish that is caught in greatest abundance, will be most frequently used in this way : in these situations, therefore, where they are in the greatest abundance, it is of considerable importance to be able to use them to advantage.

A compost prepared in this way will be found an excellent top-dressing for any sort of crop, if applied at a proper season. For wheat, if used early in the spring, it will answer well ; or for barley, either harrowed in with the seed, or applied upon the young crop. It may likewise be used for drill crops with great ease and accuracy.

17. *On the Hyssop of St John, and the Reed of St. Matthew\*.*

Some critics upon this passage of St. John †, taking the Hyssop of Judæa to be the same plant and of the same growth with ours, have conceived, either that the Hyssop was not used as the means of lifting up the sponge, or, that the word *Hyssop* is not the true reading of the text. These two opinions have given rise to many ingenious observations and conjectures which it is no part of our business to detail. The following remarks, perhaps, may incline the reader to think that the Hyssop of Judæa, that is, *azoub*, was not the same with our Hyssop, or, however, of a much superior growth, and therefore that the *καλαυρας* of St. Matthew ‡, and the *σκευης* of St. John, may be the same.

The Jews reckon four, Kimchi says seven, species of Hyssop. It appears from the Talmud, that Hyssop was gathered not only for the use of the table, but also for *wood*; *i. e.* I suppose, they used it for *fuel*, as the

\* By the Rev. Newcome Cappe.

† John xix. 29.      ‡ Matthew xxvi. 48.

Egyptians did the reed and the papyrus \* : it is mentioned also among the reeds and boughs, with which the Jews covered their booths at the feast of Tabernacles.—In the 1 Kings iv. 33, Hyssop of one species, though it stands opposed to the Cedar of Lebanon, appears to have been clasped by Solomon among *trees*. It is no objection to this remark, that it is called the Hyssop that *springeth out of the wall*; for the original might, with equal justice, have been rendered *that groweth AGAINST or BY the wall*; and, perhaps, *that groweth upon ruins*, viz. out of the rubbish; or, *that groweth upon or by the ramparts*, viz. of Jerusalem, or any other city, that is, of which there is abundance without the walls of the city, or which is known to grow in such situations. It is true that the word which is here translated *trees*, appears from a passage in the book of Joshua †, to comprehend under it the *stalks of flax*: In this, however, there is nothing inconsistent with the opinion that the *Hyssop of the wall* was an aborescent plant, holding, according to Solomon's arrangement,

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\* Ulpian in Digest. lib. xxxii. leg. 55. sect. 5. Ed. Amst. Corporis juris civilis 1700, p. 573. vol. 1.

† Joshua ii. 6.

the lowest place in that class, of which the Cedar of Lebanon held the highest : for why may not the flax of Palestine, have been as much a tree, as the mustard of it was ? However, if any thing that was called *Hyssop* in the East, was of a growth as great only as that of *our* flax, St. John's *ὑσσωπός* may be the same with the *καλαμός* of St. Matthew ; for it might afford a stalk of length and strength sufficient to raise the sponge to the mouth of a person hanging on the cross. But there is reason to believe *more* than this concerning the *Hyssop of the wall* ; for if it had not been a tree properly so called, *the Seventy* \*, and *Josephus* †, who could not but be acquainted with the ordinary productions of their own country, in translating this passage, could never have rendered by the terms ξυλόν and δεινόν, that Hebrew word *Otz*, that comprehends both the Cedar and the Hyssop. To this we may add, that *Isaac Ben Omran* ‡, according to *Bochart's* Latin version of his Arabic, says, “ That the

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\* Greek version of 1 Kings iv. xxxiii.

† Joseph. Antiq. Jud. lib. viii. cap. 2. sect. 5. p. 419.  
‡ vol. Ed. Haverc.

‡ Bochart, Hierozoican. I P. lib. ii. cap. 50. p. 590.

dry Hyssop grows upon the mountains of Jerusalem, and extends its branches over the ground to the length of a cubit, or near it." *Ben Omran* was upon the spot; he speaks from his own knowledge, and I apprehend that his cubit wanted but two or three inches of two English feet. *Christ* was crucified upon the mountains where this *Hyssop* grew, and there can be no doubt, that if the *branch* was not sufficient for the purpose of which *St. John* speaks, the *stem*, however, could not *but* be so. Suppose the *Hyssop* of the East to be the same plant with ours, that it might, nevertheless, be of much larger growth, seems probable, from this circumstance, that the *Mustard* was. *Lightfoot* and *Tremellius* have quoted two passages from the *Talmud*, in one of which we are told of a *Mustard-tree*, one of the boughs of which covered the tent of a potter: and, in the other, of another tree of the same kind, the owner of which was wont to climb it, as men climb up a *fig-tree*. Now, though these stories may deserve no *farther* credit, yet certainly so much is due to them, as to induce us to believe that the *Mustard* was a large, tall, strong plant. To have feigned such exaggerations concerning a plant which never had these

characters, could only have discredited and disgraced both the authors and the propagators of the story. Pliny, in the ninth chapter of the nineteenth book of his *Natural History*, says, that at Rosea, in the country of the Sabines, the hemp plant grows to the height of a tree. And Maldonat, a Spanish Commentator, says, that in Spain he has often seen the Mustard used instead of wood for heating large ovens to bake bread ; that he has seen large woods of Mustard, (*magnas sylvas*) and birds sitting upon the trees, though he never observed that they built their nests in them. To this we may add what is said of the *Milium*, and the *Sesamum* by *Herodotus* \*, whose credulity, as to what he heard, is indeed blamable enough ; but whose veracity, as to what he saw, is not to be called in question. Speaking of the country about *Babylon*, he says, “ How great a tree proceeds from the *Milium*, and from the *Sesamum*, though I know certainly, I will not say, being well persuaded that with those who have never been in this country, what I have said of its wheat and barley, will meet with little credit.” In

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\* Herod. *Clio.* Ed. fol. Gronovii, p. 78.

numerable instances may be produced to show that soil and climate are capable of making *that* a large tree in one country, which is only a shrub in another; and why may not the same law operate with the same force upon the *herbaceous* vegetable? Nay, soil alone, in the *same* climate, produces a wonderful diversity of dimension. The Marygold, which in a moist and fat earth, rises two feet high, scarcely exceeds the same number of inches in a dry and gravelly soil.

#### 18. *On the beneficial Succession of Crops* \*.

This head comprehends improvements of great magnitude and extent. The articles of culture are commonly divided into two classes, viz. one consists of crops that are said to exhaust and impoverish the land they grow upon; the other to ameliorate and improve it. This, however, must be considered in a comparative sense; for, properly speaking, there are few, if any vegetables, that are carried off the land they grow on to be consumed elsewhere, but in some measure exhaust and impoverish the soil, and render it less fertile.

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By Mr. Joseph Wimpey.

The first class, viz. those which are supposed to exhaust the land most, are fibrous-rooted plants, as wheat, barley, rye, oats, &c. The ameliorating includes all the leguminous and tap-rooted plants, as beans, pease, vetches, turnips, parsnips, carrots, clover, &c. Modern improvements are much increased by a judicious succession of interchanges among these articles. An ameliorating following an exhausting crop, prepares the land for another exhausting crop, especially if it be a hoeing one ; for, by judicious management, the land may be constantly cropped for many years in succession, without the intervention of a fallow every third or fourth year, as was heretofore the practice.

#### 19. *On Sea Weed\**.

Sea weed is used as a Manure upon almost every part of the coast where it can be obtained in sufficient quantity, and wherever the practice prevails, its effects are distinctly marked by producing early and luxuriant crops. In several parts of the kingdom, the value of the land has increased in a sixfold proportion, from

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\* By Mr. R. Somerville.

the circumstance of the occupier having access to this Manure ; in the county of Haddington particularly, there are several farms that were formerly let from 10s. to 15s. an acre, which are now rented at £2. 10s. and three guineas ; some of these lands are situated upon a dry limestone bottom, and upon these the sea-weed has produced the most surprising effects.

The common practice is to spread the weed immediately after it is brought from the shore, either upon the stubbles or grass-lands. When laid upon the stubble, it is generally ploughed in as soon as possible after spreading ; farmers who use much of it, never lay it in heaps to ferment, as they observe that both the quantity and quality are impaired by treating it in this way, so much so, that a load of fresh ware will be of more service, if laid upon the soil immediately after it is thrown out by the tide, than two loads when laid in a heap and left to ferment. In this respect sea ware and all marine plants differ from most vegetable and animal Manures ; to render the latter completely useful, fermentation is indispensable ; the former, on the contrary, producing the greatest benefit in its recent state.

In most cases, ware may be conveniently used in this way, for where a farm is under a proper rotation, there will always be ground to lay it upon : during the winter months it may be laid upon the ley and stubble fields, and in the spring upon the bean and barley lands ; during summer, the fallows will require all that can be collected, and by the time these are sufficiently manured, the clover fields, after the first cutting, will be ready to receive the remainder : through the autumn the stubble fields will require all that can be collected. Thus throughout the whole year this valuable Manure may be used as soon as it is thrown upon the beach, and experience sufficiently proves that its greatest value is in that state.

If, however, it should at any time happen that more weed is thrown out than can be conveniently used, it is an object of importance to preserve its qualities as much as possible. When it is laid up in heaps by itself, this cannot be done ; for, as we have before observed, the quantity is not only diminished, but its valuable qualities very much impaired. The only probable way of preserving it, seems to be by making it into a compost with earth, and a small proportion of lime. If the quan-

tity of earth is great enough to absorb and retain the juices and salts of the ware, the proportion of lime moderate, and the whole thoroughly incorporated, and afterwards protected from heavy rains, it would be found nearly as valuable as in a fresh state, perhaps equally so; but it must be observed, that if the compost is placed either upon a declivity, or has an open gravelly bottom, and is at the same time exposed to every shower that falls, its value will be small indeed; for the alkaline salts and oil being completely dissolved and mixed with the earth, will be readily taken up and washed away by every shower that falls; and when the farmer comes to use his compost, in place of finding it saturated with these rich principles, it will, upon examination, be found to consist almost entirely of earth; in short, every one of the precautions recommended in selecting a spot for the scite of an ordinary dunghill, apply with equal, indeed greater, force to the present article, as its salts and oils are so much attenuated, that they dissolve in water more readily than even those of stable dung.

After the ingredients are properly mixed and prepared, lay them up in the form of a

ridge, with a pretty sharp angle at top, covered to the depth of two or three inches with earth, well beat with the back of a spade, and afterwards defended from the rains with straw.

This compost will be found a good dressing for young crops of every description, and may be used either at the time of sowing the grain and harrowed in along with it, or after the plants have made some progress; upon wheat it should always be used upon the young crop early in the spring.

20. *On the Lolium Perenne, or Ray-grass\*.*

This is an excellent grass, both for pasture and hay, all sorts of cattle being fond of it; clean hay of this grass is particularly preferable for race-horses and hunters, as it does not affect their wind, and blow them, as other hay does; and notwithstanding it runs all to bents, yet the juice is so concentrated in them, as to afford greater nourishment to a horse than twice the quantity of common hay.

The celebrated Mr. RAY, and after him

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\* By Mr. William Sole.

SIR JOHN HILL, both say of this grass “Locis nonnullis pro jumentorum pabulo seritur, et Ray-grass dicitur; est enim pingue, et ponderosum adeoque jumentis saginandis aptissimum.” *Hill, Flor. Britan.*

It suits most of the stoney corn-fields about Bath. Mr. CROMBE had a fine crop of it last summer, well got in; and his groom informs me, that the horses are so fond of it, as to give it the preference to corn.

#### 21. *On Tanner's Bark* \*.

Some writers in Agriculture have recommended tanner's bark as a manure. In its raw state it is not found to be of much service, but from some experiments made by the late Mr. John Hunter, it certainly, in process of time, is convertable into vegetable mould. When it becomes rotten, and is spread pretty thick, it is found of use upon grass land. But the most likely way of using it, is that of mixing it with lime.

An intelligent Agriculturist recommends

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\* By Mr. Somerville.

the following plan for using this article. After it is taken out of the tan-pit, let it be mixed with an equal quantity of fresh horse dung, including the litter, and cover it from rain, but let the whole be kept moist. When the heat is gone off, it should be mixed with a fresh quantity of horse dung, and the heat renewed: when the heat is again gone off, the whole being made into a compost with chalk, will form as enriching a manure as can be procured. Mr. Blakeley, of Eschal, who first made the experiment, mixed two waggon loads of tan, after it had been used by the tanners, with a waggon load of unsack'd lime, which lay together for a week, and being used as a top-dressing for turnips, and grass ground, was found to be a most excellent manure.

## 22. *On Soot* \*.

Soot is used as a manure in almost every part of the island, when it can be procured in sufficient quantities, and is applied in every different shape, and to all the different crops. Used in its simple state, it answers best upon

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\* By Mr. Somerville.

light gravel, chalk, or lime-stone soils; if in a compost, the proper proportions are, two loads of soot, the same quantity of lime, and ten loads of earth. The soot and earth should be well incorporated, previous to the application of the lime, and allowed to remain in a heap for a week or ten days, then turned, and the lime added in regular stratum as it is turned over; in this state it may remain for a month or six weeks, and be again turned, taking care to break every part of it as small as possible by working it well with the spade; in a week or two more it will be ready for use.

The advantage of preparing soot in this way, is obvious; by mixing it first with the earth, the operation of the lime is prevented from being too severe, and when the dissolution of the soot does take place, it goes on gradually, and every part of it is absorbed, and retained by the earth with which it is mixed. The lime and volatile alkali will unite and form a caustic volatile salt, which will completely dissolve and separate the oily particles and render them miscible with water; and the compound, thus prepared, will consist of rich nourishment for plants. This compost may be employed upon every sort of

grain, especially for wheat or barley, and if rain fall soon after it is laid on, it will immediately begin to operate.

It seems to be a matter of no very great consequence, whether it is harrowed in with the seed, or used as a top-dressing upon the young crop without harrowing; for wheat it certainly should be reserved till the spring; as if it is used before winter, the greatest part of it will be washed away, before the plants have any occasion for it. The only risk that attends using it as a top-dressing without harrowing is, when dry weather immediately follows; when this happens, part of its valuable qualities will be lost, and the remainder, aided by the heat of the sun, may prove detrimental to the tender plants. By harrowing it in with the seed, this evil will be avoided, as it will then be incorporated with the soil, which will both prevent the volatile parts from being exhaled, and the heat of the compost from doing any injury to the tender plants. When soot is sown by the hand, equal parts of soot, lime, and mould, should be used, always taking care to mix the soot and earth first, and to apply the lime in as active a state as possible. For drill crops, this compound

admits of being used with great facility and precision.

### 23. *On Pleughing in of Green Crops* \*.

All vegetables afford, in different proportions, manure of considerable value; the practice of ploughing in green plants for the purpose of enriching the soil, is very ancient, and in particular, is recommended by all the Roman writers in husbandry.

Pease, beans, buck-wheat, turnips, and other moist and juicy plants, if ploughed in in full bloom, at which time they abound most in sap, yield a valuable manure. This mode of fertilizing the soil is less practised than it deserves. In Warwickshire, vetches and buck-wheat are sown and ploughed in for manure. It appears from the report of the County of Nottingham, that clover ploughed in as a preparation for wheat, has been found to answer. When it is considered at what small expense of prime cost, carriage, and other charges, this species of manure is ob-

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\* By Mr. Somerville.

tained, it is to be wondered at that it has not been more generally adopted in this island. It is of all others the most economical, and might, no doubt, be used on many occasions, in place of a complete summer fallow, as a preparation for a crop of wheat; in which case the price of the seeds, which is almost the only expense, would be amply repaid by the saving that would take place in the article of labour.

The practice of ploughing in green crops might be much improved, by laying on a certain quantity of lime, chalk, or marl, according to the nature of the soil. This would tend greatly to hasten the fermentation of the green crop ploughed in, and bring the land sooner into a proper state to afford nourishment to the succeeding crop of wheat.

#### 24. *On Putrid Water from the Steeping of Flax and Hemp* \*.

It is stated, in a valuable report laid before the Board of Agriculture, that the land on which flax was spread for drying, after being steeped in water, had been greatly improved by it. A gentleman was thence induced to

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\* By Mr. Billingsley.

apply the water used in steeping flax, to pasture land, by means of carts, similar to those used near London for watering the roads. The effect was astonishing; having advanced the land in value from 10s. to 50s. per acre. This liquid is much superior to animal urine.

In Lincolnshire, where the growing of flax and hemp is much attended to, they find the sediment of the pits, in which flax or hemp have been steeped, a very valuable manure; and considering this circumstance, it would appear that an idea commonly circulated, that flax and hemp ought not to be cultivated in this country, because they are exhausting crops, *and return nothing to the soil*, is not well founded. It is not yet ascertained to what extent manure from an acre of flax can be obtained, but it is probably considerable.

The circumstance above alluded to, naturally leads to the following observations.

1st, It is well known that flax will grow in almost any part of the country, however elevated. In consequence of the rapidity with which it grows, and the short time necessary for its remaining on the ground, it is hardly

ever injured by the frost. If, therefore, any quantity of flax was raised in the higher parts of our mountainous districts, and kept in ponds or reservoirs of water there, the water might be converted into a useful manure, and which, by irrigating the lands below, might convert them into excellent pasture.

2d, The second observation is, that the improving water, as a manure, has been much less attended to than probably it deserves. To make water fit for that purpose, nothing more is necessary than to render it putrid. From its being in a liquid state, it seems to be better adapted for being brought into a putrescent state than earth, and other substances of a more compact and closer nature. If any Chemist could discover a method of quickly rendering a considerable quantity of water putrid, at a small expense, he would probably do more for the improvement of Agriculture, than could possibly be effected by almost any other discovery. The most likely mode is to render the water stagnant, and then to put to it all kinds of animal and vegetable substances.

25. *On Paring and Burning* \*.

When land is pared and burned, I hold it to be a good and profitable plan to give it a dressing of compost earth, and to spread the ashes and it together while they are yet warm, and immediately to plough them under. The ashes impregnate the compost with their saline virtues, and the compost replaces the soil destroyed by the action of the fire.

26. *On Flax-Seed and Hemp-Seed, as a Manure.*  
*A Speculation* †.

There is, perhaps, no article in which less attention has hitherto been paid, than to the flax and hemp-seed raised in Great Britain: it is seldom that either flax or hemp are raised for the sake of the seed; indeed it is found impossible to have the seed in a great degree of perfection, without hurting very materially the quality of the flax or hemp. In this way, little of what is raised in Britain is sown a second time, and an annual supply of foreign seed is, by that means, indispen-

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\* By Mr. Greenall.

† By Mr. R. Somerville.

sable. But though the seed of both flax and hemp may, in that stage of their growth, be very unfit for sowing, yet they will, upon examination, be found to contain a considerable quantity of oil, which, by proper management, may be rendered highly useful.

It is painful to observe the present way in which green flax-seed is managed: as soon as the flax is taken out of the ground, the seed is generally stripped off and thrown away; in place of which, if all such seed was collected, broke through a mill, and afterwards made into composts in the way afterwards to be mentioned, it might be applied as a top-dressing, and in that state, if either returned to the soil upon which it originally grew, it would materially lessen the bad effects of the preceding crop, by restoring to the ground a considerable proportion of what had been taken from it, or if employed upon other lands, would be found a manure of very great value.

The best way of using these seeds is, after they are completely broke through a mill, to mix them with about ten times their own bulk of fine soft earth; in this state they should be left for a fortnight, at the end of which, the heap should be turned, and a pro-

portion of pot-ash, or quick lime, added ; the whole should be well incorporated, and allowed to remain for a month, when it should again be turned, completely mixed, and in a week after it will be ready for use. A compost, prepared in this way, ought never to be used in any other shape than as a top-dressing. Where pot-ash is mixed with the bruised seed, and only a small quantity of earth, the compost may be put on by the hand, either upon broad-cast or drill crops ; in that shape the dressing will be prepared with much ease, and at a very small expense.

Where saw-dust can be obtained, the compost will be still more easily prepared and applied ; for, by mixing two bushels of saw-dust with the same quantity of bruised flax or hemp seed, and afterwards adding about ten pounds of pot-ash, dissolved in boiling water ; a compost may be made that will afford a sufficient top-dressing for an acre.

In cases where plenty of good earth can be got, an excellent manure will be made, by mixing the broken seeds with quick lime ; for that purpose, three parts of the earth, broke very fine, should be well mixed with one part of the seeds, and after remaining in that state

for a week, the heap should be turned, and a quantity of hot lime added ; the proportion of this last will require to be at least twice that of the seed ; the whole should be well incorporated, and left at rest a sufficient time to ensure the operation of the lime upon the oil, which, when only a small quantity of earth is used, will seldom require more than three weeks, or a month, at most ; it should then be turned, and any given quantity of earth mixed with it, always taking care to observe, that no less of the oily seeds than two bushels be employed upon an acre. Where much earth is used, this will be found an excellent dressing, as it will be found, upon trial, both to thicken the staple of the land, and act as a manure at the same time. Much benefit will be derived from mixing a proportion of earth with the seeds, previous to the addition of lime, for the earth will not only absorb, and retain all that part of the oil which the breaking of the seeds has rendered loose, but it will also prevent the quick lime from doing mischief, by too hasty a dissolution.

It may, and no doubt will, be objected to by many, that the quantity of green flax seed, at present produced upon a single farm, is so

small, as to render it a matter of indifference whether it is preserved, or thrown away. It is this inattention of farmers to little matters, which constitutes their greater faults: they seldom consider, that the greatest sums are made up of the smallest and most trifling coins; and that, though the quantity of any article produced upon a farm, may, when taken by itself, be no great object; yet, when the whole that may be saved in a parish, a district, or a kingdom, is put together, the aggregate will be found very considerable.

27. *On Clay Land, too strong for Turnips* \*.

A long course of observation has taught me, that when such soils have been many years in pasture, and are become well covered with good sorts of grass, affording a thick, fine herbage, it can be by no means advisable to convert them into temporary tillage; for it is impossible, with any system of management whatever, even with the aid of expensive manures, within any reasonable period, to bring such land to so good a turf as before it was ploughed.

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\* By Mr. Boys.

There are instances innumerable, in the South of England, of grass lands, separated only by a ditch or fence, where the old grass fields are worth from 10s. to 20s. per acre, more than those which have been lately in tillage; although they have been laid down in well-managed summer fallows with the best kinds of grass seeds. I have two fields of eight acres each, on a stiff clay, contiguous to each other, on a dead level, the soil in every respect the same; one piece is supposed not to have been ploughed for centuries, the other was ploughed and laid down to grass about thirty years ago; and although both have been stocked and managed precisely in the same manner, yet the old grass is at this time worth more than double the other. To convert such lands into tillage, with a view of returning them into pasture, would be an injury that no temporary advantage could recompense.

#### 28. *On the Ruta Baga, or Swedish Turnip* \*.

In the year 1796, I sowed a few drills of this turnip. These attained a good size, and were not at all affected by the severe frost

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\* By —— Campbell, M. D. Lancaster.

of that winter, which destroyed the general crop of other turnips. The thermometer fell, on the 27th of December of that year, to 12 degrees of Farhenheit, which is an intensity of cold that the common turnip cannot withstand. It is certainly an acquisition of no common magnitude, to have a winter food for cattle which is inaccessible to frost, so that it can at all times be taken fresh from the field where it grows, (for however the ground be frozen, they may be got up by a pick-axe,) and which continues in perfection through the whole spring of the year, so late as the month of May, and until grass springs again. These properties of the Swedish turnip, point out the propriety of its constituting a part of the winter food, at least of every person who has a stock of cattle. It seldom happens that any frost, so severe as materially to injure the turnips, occurs before Christmas: and if the common sorts were to be resorted to until about that period, and the Swedish for the remainder of the season, we should have so certain a supply, as to bid defiance to any inclemency of weather.

There is one circumstance attending the cultivation of the Swedish turnip, which de-

serves attention; which is, that they will not come to a good size, except with a large quantity of manure, (stable dung.) I have understood that they have been tried in many places in the county of Lancaster, and fallen into disrepute, from their not acquiring any greater size than a carrot, which has been owing to the circumstance alluded to, as I have myself found to be the case, where the full quantity of dung had not been used. It appears too, that, from this circumstance, the drill system is particularly suited to the cultivation and growth of this species of turnip, as the roots are certain to meet with dung beneath. Those I have raised, particularly in the present year, are of a good size, as large as eight or nine pounds weight. They are so much more solid than the common turnip, that, on weighing a load of three Winchester bushels of each, the one weighed 180 pounds, while the other was 264 pounds in weight. For the table, the Swedish is certainly the best turnip that has yet been introduced, and where it is known, bears a decided preference in the market.

The seed of the Swedish turnip should be sown in May, in order to give this species an opportunity of acquiring its full size.

I am sorry to observe an inferior variety of the Swedish turnip becoming more general for these two last years: it is not distinguishable whilst growing, but is upon pulling. The rind is white, whilst the true Ruta Baga is yellow; this puts out large tap-roots, which renders it unsightly, and less marketable, whilst the other is round and compact as to its roots. It is also less palatable for the table. Great attention will be necessary on the part of those who raise the seed, to get rid of this species, otherwise this turnip may get into unmerited disrepute.

#### 29. *On Dibbling* \*.

We cannot expatiate sufficiently on the excellency and importance of the dibbling husbandry. It saves two pecks of seed per acre, (no inconsiderable object in a whole kingdom;) it gives a second harvest to the poor in wheat sowing; and a third in oats; and it is universally, on any fair average, attended with an increase of crop of from two to six bushels an acre. View this practice in any light, and it will be found highly deserving

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\* By the Rev. A. Young.

of particular attention and encouragement. A man and his wife, and six children, will earn five, six, and seven guineas at wheat dibbling; and as much more by oats, pease, and beans. No crop should be put in on a flag, or layer, or on unbroken earth, in any other manner. It far exceeds drilling; which, however, is a commendable practice in many cases.

### 30. *On Yarrow (Achillæa Millefolium.)* \*

This is one of the most common and most valuable plants to be met with in England. On my farm, the cultivation of it has been carried on with success as a sheep pasture for some years. It is found on moist loams, almost equally with dry burning sands, gravels, and chalks. It has the singular quality of resisting drought in the most arid soils, so that if you see, at a distance, a green spot on a burnt up close-fed pasture, twenty to one it is clothed with this plant. It is found in the richest meadows and bullock pastures. Five shillings per bushel are given for gathering the seed in October: It is a plant which de-

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\* By the Rev. A. Young.

serves great attention. Sheep are very fond of it. It forms a fourth part of the herbage of some of the fine meadows of Lombardy.

31. *On the Crested Dog's-tail, (Cynosurus cristatus)\*.*

To judge from the appearance of the bents of this grass in poor upland, but moist pastures, a man would think this a very unpromising plant; but the rich marshes of Bridgewater and Boston; the famous pasturage of Painton, in Devonshire, and those close to Mr. Buller's Castle, near Leskeard, in Cornwall; Mr. Thorn's bullock-grounds, on a dunstone-bottom, near Tavistock; Mrs. Williams' at Little Malvern, in Worcestershire (which are among the richest pastures in the kingdom,) all abound very greatly in this grass; in some of them it is the predominant herbage. Mr. Marshall places it as the most prevailing plant in the best grass meadows of the vale of Pickering, in Yorkshire; some of which will feed a large cow from May-day to Michaelmas. Very fortunately this species of grass abounds with seed; so that I have had many bushels gathered in a season by poor

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By the Rev. A. Young.

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women and children, at 1s. a pound, and laid down many acres with it successfully. Attention should be paid to its being ripe, for I once ordered eight bushels to be sown on eight acres, and it failed from deficiency in ripeness.

32. *On the attention necessary to the course of Crops, previous to laying down for Grass* \*.

I esteem this to be the most important subject that has been treated of by the modern writers upon husbandry; and that on which they have thrown far more light than upon an other circumstance in Agriculture. It is a very singular and remarkable circumstance, that before the reign of his present Majesty, notwithstanding the number of books upon Agriculture, there is not one author who had any tolerable ideas upon this subject, or even annexed to it any importance. They recite courses, good, bad, and execrable, in the same tone; as matters not open to praise or censure; and unconnected with any principles that could throw light on the arrangement of crops: But when once the idea

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\* By the Rev. A. Young.

was properly started, its importance presently became obvious; so that thirty years have carried to great perfection the precepts which practice has afforded in this branch of rural economy.

It is well known, that some crops exhaust land much more than others: That some, notwithstanding they exhaust, return, by being consumed on the farm, as much as, or more, than they drew from the soil in their growth; that some admit profitable tillage and cleaning, while growing, and consequently clean, instead of rendering the land foul with weeds; while others, not admitting such tillage, and being exhausters, if continued in succession, will deteriorate the land, and fill it with weeds. Practice tells us, that by a due arrangement of these crops in courses, land, of almost any description, may be kept perpetually clean and in heart.

When a field is intended to be laid down to grass, it demands greater attention than common in this article of cropping it; and for a particular reason: All soils will, in a course of time, cover themselves with that assemblage

of plants, which, in common conversation, is called grass; but on some, it requires many years to bring such a covering to any value. It is, therefore, of material consequence, not only to sow grass seeds, adapted to the soil, but also to clean it, that the bad grasses, and other plants indigenous to it, shall be absolutely extirpated; or, at least, as much so as possible for management to affect: for, if such plants be left in the land, they will increase and prevail with more rapidity and effect, than the seeds chosen by the farmer; a fact we see every day with all sorts of crops: Nor is any district without numerous instances of fields so badly laid down, as to remain unproductive through a long series of years: the evil is well-known, and it may be said entirely to result from the preceding course of crops.

33. *To raise four early crops with little expense*\*.

At an early season, plant the early potatoe, and sow garden turnips, carrots, and radishes, upon a compost dunghill, that may not want turning during the time these crops are upon

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\* By A. Hunter, M. D.

the ground. In this manner, four excellent crops may be obtained, without impoverishing the dunghill in the least.

34. *On the failure of the Turnip crops in the County of Norfolk\**.

It is probable that the long and continued shallow ploughing, is the principle cause of the failure of the Turnip crops in the county of Norfolk. The common depth of ploughing is three or four inches: I have rarely seen five inches, and never six. In a long succession of the same rotations, three or four inches will necessarily be as much exhausted of those particles peculiar to fresh soils, as it possibly can be; and whatever the qualities, deficiency, or circumstance, are described by the expression common among farmers, that *the land is tired, or sick of such a crop*, such a state must necessarily take place in proportion to the shallowness of that stratum usually turned up by the plough. For this reason I would recommend experiments on a deeper tillage, six inches for instance, but to be given at the Michaelmas preceding the turnip crop; and

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\* By A. Young, Esq.

at no other time. In all the conversations I have had on the subject, I have heard no satisfactory reasons against such a practice. The common objection is, breaking what the Norfolk farmers call *the Pan*; or that subsidence of the marl or clay, which always forms immediately under the path of the plough. They think that this retains the moisture, and is consequently advantageous.

But why does it form at four or five inches? Because the tillage is no deeper. If that were five or six inches, the pan would be equally formed at seven. And it should seem on every account whatever, more beneficial to have it at that, than at a lesser depth. The moisture thus retained, would be farther removed from the powers of evaporation, which, in so pervious a soil, must take place strongly at four or five inches. I have named six or seven inches, but experiments ought to be tried on eight or nine. Can any one doubt the roots of plants penetrating to that depth, and extracting moisture and their food there? Experiments often repeated, and common observation, will assure us of that fact beyond all question.

35. *On Cow-Clover, and Cow-Wheat* \*.

I have frequently wondered that many sensible Farmers and Seedsmen with whom I am acquainted, should know so little of a plant for which the latter have so great a demand.

1st, *Cow-Clover*, or *Cow-Grass*, are, I doubt not, the same plant: But *Cow-Wheat* belongs to a very different genus; the *Melampyrum* of Linnæus.

2d, There are growing wild in this country, two species of clover, much resembling each other in size, and in the colour of their blossoms. The one is the *Trefolium Pratense*; the other the *Trefolium Alpestre* of Linnæus. The former is the common broad-leaved clover; the latter, the long-leaved, or creeping-rooted clover; for it differs from the common broad-leaved kind, not only in having longer and narrower leaves, but also in having a root not only perennial, but creeping.

Although I know with certainty that the seed of the broad-leaved clover is sold in the

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\* By Mr. W. Curtis.

London shops for the true Cow-grass, yet I have often suspected that the different name of Cow-grass might have originally been given to the long-leaved sort, from its possessing some qualities superior to the other; and its seed not having been collected, the other has supplied its place.

However this may be, the ascertaining which of the two is the best food for cattle, is certainly an object worthy of attention. If it should be found that the *Alpestre* is in any respect superior to the *Pratense*, it ought to be brought into general use. But should it prove inferior, the distinction of Cow-grass will be abolished, and the farmer will be taught to depend on broad-leaved clover only.

3d, The seeds of the Cow-wheat are not to be had in any of the London shops. From the experience that I have had in cultivating this genus of plants, they do not seem to promise much.

### 36. *On Parsnips* \*.

To cultivate this root so as to make it prove advantageous to the farmer, it will be right to

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\* By J. Hazard, Esq.

sow the seed in the autumn, immediately after it is ripe, or come to perfection; by which means the plants will appear early the following spring, and will get strong before the weeds can grow to injure them. Frosts never affect the seed, nor do the young plants ever materially suffer through the severity of the seasons. Not only on this account, but for many other reasons, the autumn is preferable to the spring sowing, as the weeds at this time will keep pace with the parsnips; and often when they are hoed or cleaned, great part of the crop is pulled up, cut out, or otherwise destroyed, as they are (when sown in the spring) so small when they first appear, as not easily to be distinguished from the weeds; and if no rains fall at that season, some of the seed will not vegetate till late in the summer; and the few plants that do appear, will scarce pay the expense of cleaning them; besides, they will never grow to any size, but be sticky or cankered, and consequently will be destitute of nutrimental juice; while, on the contrary, those that are sown in the autumn, will be large, free from the defects of the others, and fully answer the expectation of the cultivator.

The best soil for parsnips is, a rich deep

Joam, next to this is sand; or they will thrive well in a black gritty soil; but will never pay for cultivating in stone-brash, gravel, or clay soils; and they always are the largest where the earth is the deepest. Dry light land is pleasing to them, but wet, stiff, or hide-bound land is destructive. If the soil be proper, they do not require much manure. I have obtained a very good crop for three successive years, from the same land, without using any; but when I laid at the rate of about forty cart-loads of sand per acre upon a very stiff Joam, and ploughed it in, I found it answered very well, from which I conclude that a mixture of soils may be proper for this root.

It is most advisable to sow the seed in drills at about 18 inches distant from each other, that the plants may be the more conveniently hand or horse-hoed; and they will be more luxuriant if they undergo a second hoeing, and are carefully earthed so as not to cover the leaves.

If people would, in general, be attentive to the soil, the season for sowing, the cleaning and earthing the plants, and raising their seed from the largest and best parsnips, (which

should be selected and transplanted for this purpose) there is no doubt but such a crop would answer much better than a crop of carrots; they are equal, if not superior, for fatting pigs, as they make their flesh whiter, and they eat them with more satisfaction. When they are clean washed and sliced among bran, horses eat them greedily.

It is reported, that cows and oxen are fond of parsnips; if so, they are certainly well worth a farmer's attention, especially in countries where there is a scarcity of fodder.

### 37. *On Reaping Wheat\**.

Reaping of wheat so high as to leave it almost as high as the knee, is unquestionably attended with a considerable loss of grain; I should suppose not less than from two to three bushels an acre. The experiment was comparatively made by an experienced farmer of my acquaintance. Two pieces of ground in the same field were cut down by the same gang of reapers, accurately timed by a watch, and the ground carefully measured. The produce of the two patches were separately

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\* By Mr. John Brown.

thrashed and measured ; even the value of the straw in both were computed. Allowing in every respect, both of wages and victuals, for the difference of expense, by the acre, in the two ways, the advantage was very considerable in favour of low cutting ; besides the great additional quantity of fodder and manure produced by the latter. Indeed, on even a very slight consideration of the subject, it must be evident, that a considerable number of ears of wheat are always in harvest time bent down almost to the ground, which must necessarily be left uncut in high reaping. These are not, indeed, altogether lost to the community ; since they are gleaned up, in a great measure, by the poor of the parish. They are, however, in a very great degree, lost to the occupier and the proprietor of the ground, and may, in some measure, even be considered as a public loss ; for I am well convinced, that numbers prefer the indolent occupation of gleaning, who are neither too old nor too young for the more laborious and useful task of reaping. Not to mention that gleaning leads almost necessarily into strong temptations of pilfering from the sheaves, and consequently is one help, among infinite numbers, towards corrupting the morals of the

lower class of the community. I find the attention requisite to keep the gleaners within some tolerable bounds, prevents the possibility of giving that marked superintendance which is indispensably necessary for keeping the reapers in exact and proper order.

### 38. *On Poor-rates* \*.

The enormous burthen of poor-rates cannot receive too much attention from the Legislature; for no question of tillage, the price of provisions, the state of the lower classes, or indeed the general state of the kingdom, can become a topic of inquiry, without this most momentous subject being closely connected with it. In proportion to the advance of poor-rates, is the idleness and evil habits of the poor, and, with both, their wretchedness and misery. If some effective cure be not speedily adopted in a new system of support, the industry and morals of the people will suffer to an alarming degree. Rents will rise only to be dissipated; to encourage habits of reliance that will deprive the lower classes of the best principles of support; and every class will be impoverished for

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\* By the Rev. A. Young.

no other purpose but to disseminate idleness, and to perpetuate poverty. Not an hour should be lost in taking this subject into serious and deep consideration.

39. *On Mortar Rubbish* \*.

From an old house I lately took down, I carted ten loads of the rubbish over five acres of pasture ground. I am of opinion it has done more good, than if I had put on as many loads of old dung.

40. *On River Mud* †.

The river Stour, which empties itself into the sea, by Sandwich, and which admits the tide into its channel some miles, supplies in inexhaustible abundance, a silt of a marshy and saponaceous quality; impregnated, in some degree, with salt. Not doubting but it must be an excellent manure, I bought an old barge to convey the mud to a convenient place, and landed it about a quarter of a mile from whence it was taken, and about the distance of four

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\* By S. Palett, Esq.

† By R. Legrand, Esq.

miles from my farm. It was expended upon a loamy soil ; and an admirable manure it is.

41. *To cure Mossy Grass* \*.

The best method of curing old hide-bound mossy grass, is to harrow it with a common harrow, loaded with a weight ; it requires four horses, and cuts an inch and a half, or two inches deep. It should go lengthways, and across the field. This operation alone will much improve the land ; but if you add a sprinkling of good grass seeds, and some well rotted manure, it will totally destroy the moss, and be attended with very great profit.

42. *On Laying down Land to Grass* †.

From the experience of several years, I find the following to be the best and most profitable method of laying down land to grass :

First pare and burn the old turf ; take two crops of turnips in succession ; hand-hoe them well, and feed them on the land. Let the second crop of turnips be eaten off by the beginning of February ; then plough the land,

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\* By L. Smelt, Esq.

† By A. St. Leger, Esq.

and let it lie till the end of March ; after that, harrow it once or twice, as necessary : on this tillage plough again, and harrow in barley and seeds ; 8lb. of white clover ; 4lb. of trefoil ; and two quarters of clean hay-seeds per acre. The first year, let the land be fed ; it will be a very fine pasture the beginning of April, and will yield a large quantity of food throughout the year. A large field, laid in this manner, is now feeding for the second year ; and the quantity of cattle maintained, has been very great.

#### 43. *An improved Method of Laying down Land* \*.

A gentleman, who farms a considerable part of his own estate, which lies in the higher district of the county of Lincoln, has formed a new idea in regard to laying down land for the purpose of feeding sheep. Having discovered that sheep, and almost every grazing animal, were extremely fond of parsley, he justly conceived that from its warm and invigorating property it might be the means of securing his flock from disease. His custom is, after a crop of turnips, to lay down the land with a thin crop of barley ; and instead of using the com-

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\* By A. Hunter, M. D.

mon hay-seeds, he sows red and white clover, trefoil, and rye-grass, to which he adds four pounds of curled-parsley seeds, per acre. In consequence of this practice, he finds that his sheep are much less subject to what is commonly called the *Red Water*. In order to fix the roots of the seeds, his practice is to turn in the sheep for about a month into the field, as soon as the barley is removed ; after which, the pasture is shut up till the spring.

#### 44. *On the Parochial Poor* \*.

Many and great mistakes have arisen from partial views of the state and situation of the parochial poor. This numerous body may be classed under two grand divisions,—the town, and the country paupers : the former are the most numerous, and at least three-fifths of the amount of the poor rates throughout the kingdom at large, are expended in their relief. Their situation is very different to that of the country paupers, and requires very different treatment : it is among them that profligacy and improvidence more generally prevail ; and,

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\* By J. Wood, Esq.

in consequence, their frauds and impositions are to be guarded against with more vigilance and circumspection. In another respect, the situation of these two classes differs so materially, that regulations proper for the one, would operate very injuriously to the community, if extended to the other. Except in extraordinary seasons of scarcity, the distresses of the town poor, do not arise from the scantiness of their earnings, or the want of work ; the large wages paid to manufacturers and miners, operate as a temptation to idleness and excess ; and the wages of the artizan and mechanic have been advanced so as to meet the permanent average advance in the price of necessities. But the wages of the labourers nearly continue stationary. The country paupers, therefore, may be thought to have a fair claim to some advance in their parochial allowances ; but if these advances were to be extended to all the town paupers, it would produce the greatest distress, among one of the most deserving classes of the community,—the honest and industrious tradesman. The same ground for granting these additional allowances, does not exist among the general body of the town poor ; it would administer additional fuel to their vices, and increase those abuses of the

parochial fund, already so loudly and justly complained of.

45. *On Summer Fallowing* \*.

My opinion of summer fallowing is, that he who, in any situation whatever, makes the most frequent and most perfect summer fallows, with a judicious arrangement of the first and succeeding crops, farms in the best and completest manner.

The earth, as well as animals, requires rest. The isle of Thanet, the Eden of East Kent, is rendered what it is, chiefly by a constant course of summer fallows, and a happy adjustment of crops. In some parts of the isle, it would be absurd, in the extreme, to put wheat upon the fallow. Under such circumstances, the following arrangements take place, viz.

If the fallow is manured, sprat-barley is sown with the common clover; the next year the clover is depastured till the beginning of June, and laid in for seed, which generally gives a profitable crop; the next year wheat

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\* By R. Legrand, Esq.

upon the clover-*lay*; the following year (the stubble being early taken off, and the ground immediately ploughed) *pease*, and then *wheat*. The soil then having well rewarded the farmer, is refreshed again by a *summer-fallow*, which is considered as the basis of the farmer's best expectations.

40. *On sowing Turnips in a dry season* \*

Plough in the evening, beginning at six o'clock in the afternoon, and leave off at ten. Early next morning, harrow, and drill in the seed, or sow it broad-cast. The moisture imbibed by the soil during the night, will be sufficient to make the seed vegetate; and when once sprung, the ordinary dews of night will afford sufficient moisture to forward vegetation. In such a season, drilling is greatly preferable to sowing broadcast, as it lodges the seed in the bosom of the earth, where it is sure to find moisture when there is none to be found near the surface. It corresponds with this idea, to sow and harrow in the evening. Plants that are compelled to vegetate with little moisture, always come up with a sickly ap-

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\* By A. Hunter, M. D.

pearance; in which state they are sure to be attacked by the fly, against the ravages of which there is no remedy yet discovered; a speedy vegetation is the only security; and that is best obtained by having the land in a high state of cultivation.

47. *On the Scab in Sheep* \*.

Take one pound of quicksilver.

Half a pound of Venice turpentine.

Half a pint of oil of turpentine.

Four pounds of hogs-lard.

Rub the quicksilver and Venice turpentine together in a mortar, till the globules of mercury disappear, then add the oil of turpentine and hogs-lard. Mix for an ointment.

The method of using the ointment is thus †: Beginning at the head of the sheep,

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\* By Sir Joseph Banks, Bart.

† Though there does not appear to be any difference between this ointment and the Unguentum Cæruleum of the shops, I have chosen to give the receipt exactly as it was given to me. Some of our graziers begin to use it by rubbing it into the naked part of the thigh and fore leg; a practice much less troublesome, but which requires much more judgment than the above.

and proceeding from between the ears along the back to the end of the tail, the wool is to be divided in a furrow till the skin can be touched ; and as the furrow is made, the finger slightly dipped in the ointment is to be drawn along the bottom of it, where it will leave a blue stain on the skin and adjoining wool : from this furrow, similar ones must be drawn down the shoulders and thighs to the legs, as far as they are woolly ; and if the animal is much infected, two more should be drawn along each side, parallel to that on the back, and one down each side between the fore and hind legs.

Immediately after being dressed, it is usual to turn the sheep among other stock, without any fear of the infection being communicated ; and there is scarce an instance of a sheep suffering any injury from the application. In a few days the blotches dry up, the itching ceases, and the animal is completely cured : it is generally, however, thought proper not to delay the operation beyond Michaelmas.

The Hippobosca Ovina, called in Lincolnshire, Sheep Fagg, an animal well known to all shepherds, which lives among the wool,

and is hurtful to the thriving of sheep, both by the pain its bite occasions, and the blood it sucks, is radically destroyed by this application; and the wool is not at all injured. Our wool-buyers purchase the fleeces on which the stain of the ointment is visible, rather in preference to others, from an opinion that the use of it having preserved the animal from being vexed either with the Scabb or Faggs, the wool is less liable to the defect of joints or knots; a fault observed to proceed from every sudden stop in the thriving of the animal, either from want of food, or from disease.

This mode of curing was brought into that part of Lincolnshire where my property is situated, about twelve years ago, by Mr. Stephenson, of Mareham, and is now so generally received, that the scab, which used to be the terror of the farmers, and which frequently deterred the more careful of them from taking the advantage of pasturing their sheep in the fertile and extensive commons with which that district abounds, is no longer regarded with any apprehension: by far the most of them have their flock anointed in autumn, when they return from the common, whether

they show any symptoms of scab, or not ; and having done so, conclude them safe for some time, from either giving, or receiving, infection. There are people who employ themselves in the business, and contract to anoint our large sheep at five shillings a score, insuring for that price the success of the operation ; that is, agreeing, in case many of the sheep break out afresh, to repeat the operation *gratis*, even some months afterwards.

#### 48. *On Turnip Seed* \*.

It is a fact well understood by every husbandman in Norfolk, that if the seed be gathered repeatedly from untransplanted roots, the plants from that seed will become “course-necked,” and “foul-rooted ;” and the flesh of the root itself will become rigid and unpalatable. On the contrary, if it be gathered, year after year, from transplanted roots, the necks will become too fine, and the fibres too few ; the entire plant acquiring a delicate habit, and the produce, though sweet, will be small.

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\* By Mr. Marshall.

The farmer has, therefore, two extremes, both of which he ought to endeavour to avoid. In Norfolk, long experience has taught the growers of turnips, that these extremes may be avoided by transplanting two, three, or four years, and letting the plants run up the third, fourth, or fifth. This management is found to keep the stock in the desired state.

In Norfolk, an experienced farmer has discovered, that steeping old turnip-seed in water, and letting it lie a few hours in the sun before sowing, will bring it up much sooner than sowing it dry.

The most extraordinary circumstance I have ever met with in the turnip culture, is that of sowing and harrowing in the seed on *barley stubble*, immediately after the crop was off, *without ploughing*.

Some sheep-feed, in the spring, is all that is expected from this practice, and is not, it seems, unfrequently obtained upon land that is in good heart, and free from weeds. Under particular circumstances, this may be a valuable expedient upon a sheep farm.

49. *On ploughing in decayed Turnips* \*.

Some acres of field turnips rotted entirely on the ground, and were ploughed under for barley and clover. The consequence was, not only the barley, the clover, and the succeeding turf, but the oats of last year, showed, to a furrow, how far the turnips were eaten off, and where they were ploughed under.

This is an interesting incident; recommending turnips, very strongly, as a manure.

50. *On the Refuse Whale Blubber, used as a Manure* †.

In the neighbourhood of Whitby, the farmers make the Whale Blubber after the oil is taken from it, into a compost with earth, the sweepings of streets, ashes, the scourings of ditches, and stable dung. This compost should not be used till the Whale flesh is completely dissolved, which will not be in less time than twelve months, requiring to be turned over two or three times during that period. When turned over, the heap should be well coated

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\* By Mr. Marshall.

† By Henry Cholmley, Esq.

with earth to preserve the steam, as well as to prevent the intrusion of pigs and dogs, by whom the blubber is greedily devoured. Too great a quantity of the compost should not be used upon the land, otherwise the grass will be burnt up, it being esteemed by the farmers to be a very hot manure. It is, therefore, the best way to take off this burning quality, by increasing the quantity of the materials added to the blubber, in forming the compost. It is found, from the observation of some farmers, in the neighbourhood of Hull, that a ton of the blubber is sufficient to make twenty loads of compost ; but of this, every farmer will form a judgment from the nature of the materials used. By an addition of lime to the compost, it is probable that the dissolution of the animal part of it will be the sooner accomplished. Of the compost, when judiciously made, from six to ten cart loads will be sufficient for an acre of grass land. This being a new kind of manure, we must consider experience as our best director in the application of it. How far it may be useful as a top-dressing for wheat, must be determined by experiment.

In every respect, the blubber may be considered as similar to night soil, a species of

manure much used in Flanders, where farming is carried on with great correctness.

PRICES AT HULL.

Grease, . . . . .	32s. per ton.
Finks, . . . . .	21s.
Gums, . . . . .	15s.

51. *On rubbing posts for Swine* \*.

Having occasion to shift two hogs out of a stye without a rubbing post, into another with one, accidentally put up to support the roof, I had a full opportunity of observing its use.

The animals when they went in, were dirty, with broken ragged coats, and with dull heavy countenances. In a few days, they cleared away their coats, cleaned their skins, and became sleeky haired; the *enjoyments of the post* were discernible even in their looks; and in their liveliness and apparent contentment.

52. *On Folding Sheep* †.

In Wilts and Hants, sheep are usually folded

\* By Mr. Marshall.

† By a Somerset farmer.

the whole year. A fold of ewes and lambs, from a good meadow, is extremely valuable, it being the goodness of the feed on which depend both the quantity and worth of the dung. Eight hundred couples will cover an acre in a night; which may be fairly estimated at 16s. often 20s. for the ensuing barley crop. The summer dung decreases much in value, till two or three weeks before wheat sowing; then again it increases; and where they can sow immediately after the fold, the dung of 1600 sheep, which are sufficient, at that season of the year, for an acre, is worth as much as the 800 couples were for barley. The value of the manure arising from 200 sheep, may be justly stated at 15l. per annum.

### 53. *On Sainfoin Hay\**.

The celebrated Mr. Coke, of Holkham, makes it an invariable rule never to give his sheep any turnips after March; from that time he depends entirely on Sainfoin Hay, and sometimes begins sooner: to this food he attributes the health of his sheep at that season. Before he practised this husbandry, he had

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\* By A. Young, Esq.

great losses, as well as others, by the flow of milk by turnips in the spring; this hay gives fully sufficient without that danger.

54. *On the choice of Seeds\**.

When seeds of every kind are sown, it is of the utmost consequence that they be in possession of vegetable life. This may be proved by sowing them upon cotton, or flannel, kept moist by water, and placed in a warm room. If the seeds are good, they will swell, and show to the naked eye a disposition to vegetate. All kinds of small seeds should be made subject to this trial, previous to their being sown upon a large scale. This easy experiment will, with a certainty, detect the fraudulent mixture of old and new seeds.

55. *To remove the rancidness of Turnip Butter, and the bitterness of Barley-Straw Butter†.*

Instead of putting the cream immediately as it is skimmed off the milk, into the jar or other retaining vessel, pour it upon hot water, and after standing to cool, skim it off the water.

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\* By A. Hunter, M. D.

† By Mr. Marshall.

56. *On Hand-Weeding Turnips* \*.

It often happens that the last hoeing takes place so early as to permit the seeds of weeds to come to perfection. Under such circumstances, the charlock, which had escaped the hoers, frequently makes its appearance, and which, if not removed, will materially injure the land. The yellow appearance of the field, will discover to the discerning farmer the absolute necessity of calling in the hand-weeders before this destructive weed shall have perfected its seed. In such a case, the expense will bear no proportion to the advantage gained.

57. *On Marl* †.

The marling of land is one of the most important works of husbandry. Those farmers who have marl in their fields, and do not endeavour to discover it, are much to be condemned. The astonishing improvements that this kind of manure has made in Norfolk, Lancashire, and Cheshire, ought, long ago, to have roused the generality of farmers from that

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\* By A. Hunter, M. D.

† By A. Hunter, M. D.

kind of supineness that too frequently influences their operations. By means of the screw-borer, the different strata of an extensive district may be known at a trifling expense. If marl cannot be found, clay may be discovered, which will answer equally well upon lands of too light a nature. At other times a bed of sand may be found, which will answer the purpose of lightening lands of too stiff a texture. Proceeding in this manner, the farmer will be sure to discover something that he may convert into a profitable use. However, in opposition to this expensive improvement, it must be confessed, that the want of a lease must for ever operate. Whatever confidence may subsist between landlord and tenant, and whatever arguments may be brought in support of annual leases, I am decidedly of opinion, that millions are annually lost to the public in consequence of the refusal of long leases. No spirited and expensive improvement can be effected in lands that are not held under a lease of a reasonable duration. Such an attempt on the part of a farmer would be considered as an act of insanity, unless in the cases when the farmer is both landlord and occupier.

And here I do not wish to be considered as recommending leases upon farms inclosed, and improved nearly to their extent. In such cases, leases are unnecessary. But when the farm consists of much waste, boggy, and unprofitable land, with a neglected inclosure, and labouring under other discouraging circumstances, I dare confidently say, that it would be highly beneficial to the owner and his family, to grant a long lease to a substantial tenant, willing to enter upon it, under the usual covenants.

### 58. *On feeding Pigs upon unripe Garden Beans\**.

For this kind of husbandry I selected a four acre field of turnip land, and manured it well. Early in February, I sowed one-third of it with Garden Beans, in rows of three feet from each other, and in the following manner. In a furrow made by the plough, the beans were sown by hand, and the ploughings were so conducted that a ridge was formed over the sown beans. When the beans had made a sprout of about an inch in length, and before they appeared upon the surface, I harrowed

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\* By Mr. Matthew Cross.

down the ridges across, which reduced the field to a level. When the beans were three inches in height, I ploughed a furrow from them, which brought the land to have a ridge between the rows, and this operation answered the purpose of destroying weeds. At this time, the beans were carefully hand-hoed and weeded, so that no weeds were to be seen in the intervals, or in the rows. As soon as the weeds made their appearance in the intervals, I split the ridge, throwing the earth towards the beans. About the end of May, I again ploughed from the beans which made a ridge between the rows, and upon this ridge I drilled turnip seed, with the Scotch drill, covering the seed with a rake. This drill is so light, that it may be drawn by a boy. At a proper season, the turnips were hand-hoed, and at the same time a due attention was paid to the weeds growing among the beans. The land thus disposed, appeared in alternate rows of beans and turnips, so that each row was exactly three feet from that of their own kind, and in consequence of this disposition, the whole of the surface was nearly covered. When the beans began to lose their flowers and to show a disposition to pod, they were drawn by hand and given to the pigs, in a fold-yard well littered

with straw ; and, in order to have a regular supply, the beans were sown at three different times, viz. in February, March, and April, so that the pigs had always plenty of succulent food, in which state the beans were always the most acceptable. The pigs were bought in on the 18th of May, and were kept on clover till the beans were ready. The beans being consumed, the pigs were disposed of on the 18th of September, to the distillers, being in a state fit for their use ; but a few were reserved to be finished, with beans and barley-meal, for bacon. This year four acres maintained 38 pigs, bought in when ten weeks old, and which were sold for forty pounds above the prime cost ; so that estimating the expense for rent, ploughing, seed, &c. at twenty pounds, there was a profit of five pounds an acre, besides the turnips, and forty loads of rich manure, both of which I cannot value at less than twenty pounds more. The four acres might still have been rendered more profitable by planting brocoli on the bean stubble. Next year I mean to improve upon this plan, as well by the purchase of larger pigs, as by making an immediate use of the land left unoccupied in June. At present, I wish this scheme to be considered only as a Speculation, not unworthy of attention.

59. *On Urine, as a Manure\*.*

Some years ago, in the lowest part of my Inn yard, I caused a large reservoir to be dug, twenty feet square, and fourteen deep. The soil in which it was dug being rather porous, I had it lined with wet clay, as if I had been making a fish-pond, and afterwards lined it throughout with bricks, set in terrace mortar.

When this was done, I had the drains from all my stables, and my cow-house, conducted to this reservoir, as well as a capital drain from my kitchen and wash-house. The reservoir was covered over with stout beams, and thick oaken planks; an aperture being left, wherein to fix a strong pump.

By this contrivance, I preserved the horse-stale made in the stables, which was very considerable in quantity, as well as all the pot-liquor, brine, suds, and chamberlye made in my house.

This compost, if I may so call it, is my best

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\* By Mr. Margrave.

manure ; but it requires some little caution in using it.

I apply this manure to all my crops indiscriminately, and find it succeed with all ; the only danger being the overdoing it. When I lay on this manure, I get the water-cart first half filled with pond-water, and then bringing it to the pump above-mentioned, complete the filling it with the contents of the reservoir. This I find is a good method of correcting the great heat of the manure in question, which would of itself, in particular seasons, be apt to burn some crops.

I find this manure to be of particular service in procuring a large burden of grass, not only in my upland pastures, and meadows, but in all my grass-grounds. I begin putting it on immediately after Christmas, and complete the dressing before the end of February. I find this the best season for doing it, on many accounts ; particularly as the spring rains, soon succeeding, wash off from the blades of the grass the saline particles, which would otherwise be disgusting to the cattle.

When I dress my wheat with this manure,

I choose to do it something later; for instance, in the month of April; remembering always to correct the heat of the manure with water. On my barley, I sprinkle it still later; that is, in May for the most part, and find these methods to succeed well. ,

I receive great benefit from it in my kitchen garden, where I also refrain from the use of yard-dung, instead of which, when the ground is trenched and thrown up in winter, I give it a thorough dressing with the manure above-mentioned.

This, by the subsequent digging, when the land comes to be levelled, is well mixed with the soil, which never fails to yield me plentiful crops of pulse and other vegetables; and, what is more, my cabbages, beans, pease, &c. are much sweeter than those raised in my neighbour's gardens, which are annually enriched with abundance of rotten stable dung.

Onions receive superior benefit from this manure; they come much earlier, and are larger and sweeter than any I can purchase,

60. *On Lime upon Mossy Sward* \*.

Last autumn, four chaldrons per acre were put upon a piece of declining mossy sward, on a burning sand, in an upland situation.

The present state of it is striking. (Sept. 1787) The entire countenance of the land is changed: the sward has acquired a dark-green healthy colour; and the moss has already mostly disappeared; while the remainder of the piece (the whole eaten with sheep) is covered with a fleece of moss intermixed with parched, straw-coloured herbage.

61. *On Teasels, as cultivated in the County of Somerset* †.

The head of this plant, which is composed of well-turned vegetable hooks, is used in dressing of cloth, and I believe for no other purpose.

The most favourable soil for this plant is a strong rich clay, or what is generally denominated “good wheat land.”

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\* By Mr. Marshall.

† By John Billingsley, Esq.

Sometimes an old ley is broken up, and sometimes a wheat stubble; the seed is sown, after the rate of two pecks per acre, in the month of April. During the summer the land is worked over three or four times with long narrow spades to destroy the weeds.

In the month of November, if the plants are too thick, they are drawn out to fill up vacancies, and the plants are set at a foot distance. If, after this thinning, too many plants remain, another field is prepared, into which they are transplanted; but those plants which are never removed, produce the best heads.

At the next spring and ensuing summer, the land is worked over three or four times with the narrow spades, by which it is kept thoroughly clean, and the plants earthed up. This is called speddling.

In the month of July the uppermost heads begin to blossom, and as soon as the blossom falls, they are ripe. The gathering is performed at three different times. A man, with a knife made for the purpose, cuts the heads which are ripe, and ties them up in handfuls. After a fortnight he goes over the ground again, and at a third cutting the business is

completed. On the day of cutting they are carried into a house, and if the air be clear, they are taken out daily and exposed to the sun till they are completely dry; but great care must be taken that no rain falls on them.

The crop is very hazardous. A wet season rots them, particularly when there is much rain at the time of blossoming.

When dry, they are separated into three different parts, called kings, middlings, and scrubs; and are, after that, made into packs, containing of kings nine thousand heads, and of middling twenty thousand. The scrubs are but of little value. The average price is forty shillings per pack; and sometimes the produce is fifteen or sixteen packs an acre, at other times a total blank. There is an amazing inequality in the produce of different plants; some stocks will send forth one hundred heads, others not more than three or four.

Great attention, therefore, should be paid to the selection of seed, namely, by taking it from those plants which appear to be most prolific. This, however, is not done, but the seed is taken indiscriminately from the whole crop.

As the goodness of the crop chiefly depends on the care taken to keep the land free from weeds, leaving the plants at proper distances, and earthing them up well; and as most of the common workmen will pay more attention to their own than to another person's interest, it frequently happens that a partnership is formed between master and man. The former finds ground and ploughing, and the latter seed and labour.

At harvest the crop is divided, and each party takes a moiety.

The expense and produce of teasels may be thus estimated per acre.

		£.	s.	d.
To two years' rent	—	—	3	0
To ploughing	—	—	0	15
To workmen's labour	—	—	3	15
To making out in bundles, tying together, and teasel bands, 2s. per pack	—	—	0	14
		—	8	4
Profit	5	16	0	
	—	—	£	14
		0	0	

## BY AVERAGE PRODUCE.

	<i>L. s. d.</i>
Seven packs, at 40s.	— — 14 0 0

Tithe and taxes excepted: the first of which is generally compounded for at 5s. per acre.

The working with the spade can only be done to advantage by the men accustomed to it, who are become, by habit, so dexterous in the use of this implement, that they will even thin out a crop of carrots.

The common hoe has been tried, and though in the hand of a complete turnip-hoer, it was not found to answer.

After the crop, wheat is sown, on one ploughing, and seldom fails of a good produce; so that it may not be quite fair to charge the teasels with two years' rent.

Few soils will bear frequent repetitions of this crop; and the farmer finds it his interest to devote newly broken-up land to this culture.

62. *On the common Nettle\**.

Though the nettle is a plant, in general, considered as useless as the sea-weed in the days of Virgil, *Projecta vilior Alga. Ecl.* yet, when a proper attention is paid to it, it may become an useful article in the hands of the manufacturer. The most common plants often possess properties that, were they generally known, would raise them to that rank of estimation which they were intended to hold; and I know of no plant that deserves to be rescued from contempt so much as the common nettle. It may not, therefore, be amiss to point out the various uses to which this despised and neglected plant may be applied. Being a perennial that accommodates itself to all kinds of soil, it consequently requires little labour or expense in its field cultivation; so that the cottager and his family may be materially benefited at the smallest expense, little more than their labour being required. By a management similar to what is bestowed upon flax, a very good kind of cloth may be manufactured. During the last summer, in passing through Shropshire, I observed that many of

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\* By John Tweedy, Esq.

the ploughmen and waggoners' frocks were made of this material, which were represented to me as a clothing both durable and cheap. In Shrewsbury, carters' frocks, made of nettle-cloth, are exposed to sale ; and in many parts of the county may be observed small patches of nettles growing near the cottages, for the purpose of being manufactured into cloth. This plant, when dried, is acceptable to sheep and oxen. In France, the nettle has been manufactured into cloth of a lasting fabric ; and I am told that it may be made into paper of a good quality. In Russia, an ingenious gentleman of Moscow has discovered, that the juice of nettles is capable of dyeing woollen stuffs of a beautiful green colour ; and it is said that its roots give a yellow colour to yarn. In spring, the tops of nettles are used in pottage, being considered as a purifier of the blood. In the northern parts of Scotland, they make a good rennet, of a strong decoction of this plant. To three pints of the decoction, they put about two pounds of salt, after which they bottle it. A common spoonful of this mixture will coagulate a large bowlful of milk, in a manner, perhaps, more wholesome than is performed by animal rennet, which is often known to give a disagreeable taste to the curd employed in making cheese.

63. *On Lucern* \*.

May is the proper month for sowing the seeds of Lucern. Hand-hoeing and weeding are requisite the first year, as the plants are then too tender for the horse-hoe. Cutting once only for the first year, gives the roots time to shoot down and gather strength.

Horse-hoeing the alleys, (twenty inches wide,) after every cutting, and hand-weeding the rows in March or April, are necessary; and before it is laid up for the winter, should not, on any account, be omitted. After the last cutting and weeding, let ten or twelve loads of rotten dung be laid on each acre, and gathered up with the small plough to form the ridges over the crowns of the roots. Nothing more is necessary until the first dry day in February; then bush-harrow the ridges down into alleys.

The third year the plants appear to arrive at their perfection, as I do not perceive that they improve or diminish from that time.

Neither does dry or wet weather materially

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\* By John Pratt, Esq.

affect the growth of Lucern, as I have observed by frequently tying a silk thread on some of the plants. It grows about an inch a day, but something less when the weather is cold.

This grass has the effect of salt-marshes ; it purges, and is diuretic for three or four days, and then fattens horses at a great rate, although hardly half the allowance of corn is given.

The produce of four acres this year, maintained, with half the allowance of corn, ten horses twenty-two weeks, twenty-one horses one week, and fifteen head of cattle eight days. The field was cut four times, the first cutting being on the 7th of May, and the last about the middle of October. The drills were made by taking out the teeth of a horse-rake, and fixing in some angular teeth, like the angular chissel of the wheelers. The quantity of seed, six pounds per acre. The soil, a good hazel loam.

Sheep should never be permitted to bait on Lucern, as they will scoop out the crowns of the roots, and destroy those buds that are

formed round the crowns for the succeeding crop; but that is not the case with horned cattle.

64. *On Evaporation* \*.

In the progress of evaporation, a vast quantity of enriching particles rise, from every putrid substance, into the atmosphere, especially where the wind moves with a quick or uninterrupted current, as it does on downs, hills, and extended plains, from which it carries off more than it deposits; and thus has a tendency to impoverish such places. In situations sheltered by hills, plantations, &c. stagnant air is produced, which deposits more than it takes up. This difference tends towards enriching low land; consequently, if high and numerous hedge-rows, plantations, and lofty trees, were raised in exposed situations, they would interrupt the injurious current, and procure a milder air, which is more friendly to vegetation.

65. *On the radical Improvement of Live Stock* †.

The improvement of live stock, in a great measure, depends on improving the produce

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\* By John Middleton, Esq.

† By John Middleton, Esq.

of the soil. Plenty of tares, turnips, clover, and cole, may be raised on very ordinary land. They will support the best stock; and provided the soil be sufficiently dry to bear the treading of cattle in every season, even though the land be *naturally* poor, or exhausted by *bad husbandry*, a succession of these crops being consumed on it, will rapidly advance it into the productive class.

#### 66. *On the Mistletoe* \*.

The mistletoe, instead of rooting and growing in the earth, like other plants, fixes itself and takes root on the branches of trees. It spreads out with many branches and forms a large bush. It is commonly found upon the white thorn, the apple, the crab, the ash, and maple, but is rarely seen upon the oak; which last kind, as Mr. Ray well observes, was chiefly esteemed in medicine, owing to the superstitious honours which the antient Druids of this island paid to that plant when gathered there. This is a parasitical plant, and is always produced from seed. Some of the antients called it an excrescence on the tree, growing

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\* By A. Hunter, M. D.

without seed; which opinion is now fully confuted by a number of experiments. It is the opinion of some, that it is propagated by the mistletoe thrush, which, feeding upon the berries, leaves the seeds with its dung upon the branches of the respective trees where the plant is commonly found. Others say, that as the berries are extremely glutinous, the seeds frequently stick to the beaks of those birds, which being rubbed off upon the branches of trees, they become inoculated, as it were, and take root. In the same manner the mistletoe may be propagated by art; for if the berries, when full ripe, be rubbed upon the smooth part of the bark of some trees, they will adhere closely, and produce plants the following winter. In the garden belonging to the late Mr. James Collins of Knaresborough, there were many large plants of the mistletoe, produced in this manner upon the dwarf apple-tree: And there is at this time in my garden in York, a fine plant of mistletoe, growing upon a dwarf apple-tree, which I produced by inoculation a few years ago. Of mistletoe we have only one species growing in Europe, viz. *Viscum (album) foliis lanceolatis obtusis, caule dichotomo, spicis axillaribus*, Lin. Sp. Plant. 1451. *Mistletoe with blunt*

*spear-shaped leaves, forked stalks, and spikes of flowers rising from the wings of the stalks.* *Viscum baccis albis, C. B. P. 423. Mistletoe with white berries.*

The gathering of the mistletoe made a part of the religious worship of the Druids. When the end of the year approached, they marched with great solemnity to gather it, in order to present it to Jupiter, inviting all the world to assist at the ceremony in these words: “The new year is at hand, gather the mistletoe.” The sacrifices being ready, the priest ascended the oak, and with a golden hook cut off the mistletoe, which was received in a white garment spread for that purpose. This part of the ceremony being ended, the victims, two white bulls that never had been yoked, were brought forth and offered up to the Deity, with prayers that he would prosper those to whom he had given so precious a boon. Of the mistletoe, thus gathered, they made a potion which they administered as an antidote to all poisons, and used as a remedy to prevent sterility. Besides the mistletoe, the Druids ritually gathered the Selago, or *Firr Club-moss*, and the Samolus, or *Round-leaved Water Pimpernel*, both which they applied to medi-

cinal purposes. It may here be remarked, that the Druids, in several of their religious ceremonies, had a delicacy superior to most of the ancients: for in gathering the mistletoe they always used a golden hook: whereas, among other nations, a hook of brass was thought good enough for the like purposes:

Falcibus et messæ ad lunam quæruntur ahenis

Pubentes herbæ, —————— ÆN. lib. iv.

Partim succidit curvamine falcis aënae.

OID. MET. lib. vii.

In Sophocles, Medea is described as gathering her magic herbs with a brazen hook, and afterwards putting their juice into brazen pots.—Virgil, with great poetical elegance, compares the golden bough to the mistletoe, on account of its being an adventitious plant, and of a golden colour:

Quale solet Sylvis brumali frigore viscum  
Fronde virere nova, quod non sua seminat arbos,  
Et croceo fætu teretes circumdare truncos.

Talis erat species auri frondentis opacâ  
Iliee; sic leni crepitabit bractea vento.

ÆN. lib. vi. l. 205.

The story of the golden bough, shows that the Druids were not singular in attributing

great magical powers to scarce and beautiful plants, ritually gathered, and offered to the Gods :

Hoc sibi pulchra suum ferri Proserpina munas  
Instituit. ————— AN. I. 142.

Ergo alte vestiga oculis, et rite repertum  
Carpe manu ; ————— IB. I. 145.

And here it may not be improper to remark, that ancient customs are a considerable time before they can be effaced, even in countries that have experienced the calamities of conquest; for in France, as Keysler informs us, something of the Druidical ceremonies, relative to the mistletoe, subsists in the province of Aquitain. “ In Aquitania quotannis Prid. “ Kal. Jan. pueri atque adolescentes vicos, “ villasque obeunt, carmine stipem petentes, “ sibique, atque aliis pro voto, in exordio novi “ anni acclamantes, **AU GUY ! L'AN NEUF !**”

#### 67. *On the Age of Fruit Trees* \*.

Mr. Bucknall, in his celebrated Treatise on Fruit Trees, has proved to a demonstration, that, by proper management, fruit trees may be continued in full bearing far beyond their usual term; and, indeed, the experiments recorded

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\* By John Tweedy, Esq.

by him, prove his assertion, “ that crooked trees may be made straight, the sterile fruitful, and the old handsome.” In confirmation of part of his practice, I shall mention some circumstances regarding an apple-tree now (1802) growing at Helperby, near Easingwold, Yorkshire.

This tree, as is well authenticated, was sown a pippin the year 1670, and afterwards transplanted to where it now stands. In the year 1787, it showed evident signs of age, its fruit being small, speckled, and few in number. It was much in the situation of Spenser’s aged tree, “ its honour decayed, its branches sere.” In the winter of that year, a fold-yard was made near it, and the liquid part of the manure made by the cattle, consequently, found its way to the roots of the tree. In the following spring it put on the appearance of full vegetation, sending out youthful shoots from the stem, immediately under the decayed branches. These have ever since borne fruit plentifully, of a proper size, and good flavour. On the old branches, at the top of the tree, the fruit is small and speckled. Had this tree undergone the judicious pruning of Mr. Bucknall, there is not a doubt of its perfect renovation.

## ESSAY IX.

*On the Hasel.*

OF the Hasel there are only two species :

1. **CORYLUS (avellana)** stipulis ovatis obtusis. Lin. Sp. Pl. 1417. *Hasel Nut, with oval blunt stipulæ.* *Corylus Sylvestris.*—C. B. P. 418. *Wild Hasel Nut.*
2. **CORYLUS (colurna)** stipulis linearibus acutis. Lin. Sp. Pl. 1417. *Hasel Nut with narrow acute stipulæ.* *Corylus Byzantina.*—H. L. 191. *Byzantine Nut.*

The **CORYLUS**, in the Linnaean System, is of the class and order *Monoecia Polyandria*. The flowers begin to open about the twenty-fifth of January, and in a month's time are in full blow. They are small, and of a beautiful red colour. The catkins make their appearance about the middle of September.

The common Hasel grows wild in almost every part of this island, and serves very well for thickening woods. When allowed to grow,

it will make poles of twenty feet, but it is usually cut down sooner for walking-sticks, fishing-rods, withs for faggotting, &c.; for which necessary purposes it is recommended as a profitable wood.

In order to raise a coppice of Hasels, the nuts must be gathered in the autumn. These must be carefully preserved till the month of February in a moist place, to keep them from growing dry: then, having the ground well ploughed and harrowed, let drills be drawn at one yard distance; into these drop the nuts at about seven inches distance, and let them be covered with two inches of earth. When the young plants appear, they must be kept clear from weeds, in the manner usually ordered for trees planted in rows; and they must remain under that careful cultivation till the weeds are no longer to be feared. Where the plants stand too thick, they should be properly thinned, and this thinning ought to be continued till the plants are left a yard asunder each way. A Coryletum may also be raised from plants drawn from the seminary, when they are a foot or two feet high. These should be planted where they are to remain at one yard asunder. In twelve years

they may be cut down for poles; but they will be ready for a second fall much sooner; and afterwards may be cut every seventh or eighth year, when the value will be from ten to fifteen pounds per acre. The chief uses to which this wood is applied, is for hurdles, faggots, hoops, and bundles of stakes. Close hurdles sell from six shillings to nine shillings a dozen. Bundles of stakes sell for seven-pence each. Hoops are worth three shillings and sixpence a bundle of sixty hoops. The Byzantine Nut is distinguished from the other species chiefly by the stipulæ, which are very narrow and acute, whereas those of the common nut are oval and obtuse. It differs also in the size of its growth, the Byzantine seldom growing higher than four or five feet, hence it got the name of *Dwarf Nut-tree*. In other respects it is like our common nut-tree; it flowers at the same time, and the fruit is produced in clusters. Mr. Miller suspects this and the Barcelona Nut to be the same.

The Filbert, or *Corylus sativa fructu oblongo*, is not a distinct species, but only a variety of the common nut. This can only be kept true to its kind by suckers, or layers, which last are observed to make the best trees. In

order to form stools, some plants of the best kinds should be procured, and the twigs layered from them should be taken off and planted in the nursery. When well rooted, they may be removed into the ground where they are to remain. In some parts of Kent, plantations of Filberts are much attended to. The trees are never permitted to rise above six feet in height, and are regularly pruned and dished out like gooseberry-bushes. They should stand at the distance of twelve feet, and when full spread, the diameter of the cup formed by the branches should be about six feet. The intermediate spaces should be cultivated with beans, turnips, and hoeing crops; for upon the constant stirring of the ground the vigour of the trees principally depends. I am well informed that near a bushel of nuts has been gathered from one tree managed in this manner. In a scarce year, Filberts in the husk are worth twenty-four shillings per bushel;—a great encouragement for plantations of this species. Hops are sometimes raised between the Filbert-trees, so that the expectations of the planter may be gratified with one and sometimes two crops.

It is an observation of great antiquity, and

well confirmed, that “ a good nut year makes a good wheat year.” Virgil speaking of the walnut-tree says,

Si superant sœtus, pariter frumenta sequentur.

GEORG. i.

I have a peculiar pleasure in laying before the public the following letter, received from a gentleman much conversant in the management of Filbert-trees. “ When the Filberts “ raised from layers are eight inches high, “ there will spring from them several small “ branches. Those in the centre must be cut “ out, in order that the tree may be trained in “ the form of a punch-bowl. The branches “ must not be permitted to exceed six feet in “ height, and all kept of an equal length. “ The trees should be planted at the distance “ of four yards from each other, and these, if “ well trained, will nearly touch in a few “ years. It will be necessary to dig well “ about them every year, and every third year “ to give them a good dressing of manure, as “ also to top the bearing branches early in “ the spring.—Carefully remove all suckers “ and shoots about the roots. A tree thus “ trained, has been known to produce two “ stone of nuts in the husk, and I am credibly

“ informed, that 400l. has been made of the  
“ produce of one acre, sold at thirty shillings  
“ per bushel, in the London market.”

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## ESSAY X.

*On the proper Husbandry for a Gentleman.*

WITH regard to gentlemen occupying large tracts of land, unless they sacrifice all other pursuits to their farm, or be uncommonly fortunate in their choice of a steward, they will find an endless trouble in their undertaking, and most probably be glad to quit it with considerable loss. But if a gentleman spends a considerable part of the year in the country, and has a constant family establishment with occasion for some horses; the expenses both of his house and stables will be considerably reduced by the occupation of about sixty acres of good land, or one hundred acres of an inferior quality. In the first case, it would be convenient to divide his farm into four arable

fields, of eight acres each, and four pastures, of seven acres each. Let the arable lands be brought into a course; that there may be every year one field sown with turnips, or planted with cabbages, (as the soil is dry or wet): one with spring corn, after the turnips or cabbages: one with clover, tares, beans, or pease, after the spring corn (the beans or pease to be kept perfectly free from weeds); and one field sown with wheat after the clover, tares, beans, or pease. And let two pastures be mowed, and two fed alternately. If the land is poor and light, it will be proper to have five arable fields of ten acres each, and five pastures of the same size. Let one arable piece be sown with turnips each year; let the turnips be succeeded by spring corn, and clover and rye-grass sown with it: one field must lie in a layer of the first year; one in a layer of the second year; and the fifth arable piece may be sown with wheat, rye, pease, oats, or barley, after having been a layer two years. And let two of the pastures be mowed in their turn, and three fed. The advantages of arranging the farm in this manner are, that the ploughed fields will produce a regular supply of summer and winter food for the cattle, and corn of different sorts with straw; the pas-

tures will afford grass for the summer, and hay for the winter; and be kept in good condition by alternate mowing and feeding. And as the preparation for the different crops upon the arable land will be at different times of the year, it may be tilled with the smallest number of cattle possible. When the fields are brought into the courses above mentioned, one pair of stout oxen will be sufficient for all the business of the farm; and, as they will live upon straw, with turnips or cabbages in the winter, with a little hay at the times of sowing, and graze in the pastures during summer, they will be kept at a very moderate expense. Indeed I think it much better to keep two oxen for that purpose, than to do the business of the farm with horses occasionally used in a carriage; because, upon such a system of economy, a prudent man loses the chief convenience of his equipage, and a thoughtless one the best seasons for the work of his farm. But to occupy such a tract of land with only two working beasts, it will be necessary that the fields are contiguous; and the ploughing, harrowing, &c. must be performed in the method commonly used in Suffolk and Norfolk: and the carting of all sorts must be done with two small carts, one for each ox. The prac-

ticability of this will appear from a calculation of the time necessary for the ploughing, harrowing, and rolling, which will show the time left for the other work of the farm. Let us take the annual tillage of the larger quantity of land. Four ploughings for ten acres of turnips, give forty acres; two ploughings for the ten acres of spring corn, twenty acres; and perhaps it may be advantageous to give two ploughings upon the ten acres of corn sown upon the breaking up the layer, which adds twenty acres more; and consequently there will be eighty acres to be ploughed yearly. We know, from experience, that a pair of oxen will plough six acres in a week; but, allowing for interruptions by bad weather, and other accidents, let us suppose them to plough only five acres weekly. Sixteen weeks, therefore, will be required for the ploughing; and, to give good allowance for the harrowing and rolling, let us add four weeks more for them; so that, together, they will take up twenty weeks annually; and the remaining thirty-two weeks will surely be thought sufficient for the carting, and all necessary work. Indeed I can with more confidence assert, that a pair of good oxen will do so much, because with four oxen I occupied a farm

several years, where more than twice as much labour was required ; and where the difficulty was increased, by great part of the arable land being so moist bottomed, that the oxen could work upon those lands only in dry seasons.

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The following may serve as a sketch of the probable expenses and returns of such a farm.

<i>Expenses.</i>	<i>£.</i>	<i>Returns.</i>	<i>£.</i>
Rent, . . . . .	50	Spring corn, . . . . .	25
Tithe and town charges,	20	Corn upon the layer, .	40
Labour, . . . . .	40	Grass or hay, with straw,	
Smith, wheelwright, and		for six horses, . . . .	60
collar-maker, . . .	10	Produce of six cows, .	30
Seed corn, . . . . .	10	Profit of hogs and poul-	
Interest of stock, . . .	5	try, . . . . .	20
Half the expense of a			—
dairy-maid, as she will		Total returns, . . .	175
have time to do other		Deduct expenses, . . .	145
work, . . . . .	10		—
	—	Profit, . . . . .	30
Total expenses, . . .	145		—
	—		

You see my estimate of the profit is not so great as that of some calculators ; but perhaps it is nearer to the truth. But I cannot con-

sider pecuniary benefit as a principal object in a plan of this kind. The advantages arising from it to a gentleman will be more material. He will find in it a pursuit very conducive to health, giving constant and interesting employment without anxiety; with something always to do, and something to expect. The succession of the various crops, and preparations for them, will furnish him with perpetual inducements to take the benefit of air and exercise upon his farm; and he will be freed from the tedious necessity of riding or walking for health's sake only. Let me add, that he who has acquired a relish for such amusements at home, will have little occasion for that dissipation which is too often the resource of those who are, by an affluent fortune, exempt from necessary attention to any profession or trade.

It may not be improper to remark, that this plan may be enlarged or contracted as required; and may often, with advantage, be partially adopted, where it cannot entirely take place. The quantity of land may be increased or diminished, according to the quantity of horses and other stock wanted by the family. Where the soil is unfavourable to the growth of common grass, it would be better to in-

crease the tillage, and rely upon clover, tares, ray-grafts, sainfoin, or lucern, both for summer grazing, and a supply of hay.

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## ESSAY XI.

*On Hatching Chickens.*

As thirteen eggs are generally placed by housewives, under one hen, being as many as she can well cover, it is certain that a great number of hens must be engaged in incubation, in order to supply the various markets where chickens are brought to be disposed of. And as incubation has nothing mysterious in it, requiring only a regular graduation of heat for the space of twenty-one days, with the occasional turning of the eggs, it seems reasonable to suppose that the Egyptian method of raising chickens may be advantageously practised in this country. And as an encouragement to such persons as have leisure and perseverance for such

a profitable employment, I shall here state the method as practised in Egypt.

The art of hatching chickens by means of ovens has long been practised in Egypt; but it is there only known to the inhabitants of a single village named *Berme*, and to those that live at a small distance from it. Towards the beginning of autumn they scatter themselves all over the country; where each person among them is ready to undertake the management of an oven, each of which is of a different size; but, in general, they are capable of containing from forty to fourscore thousand eggs. The number of these ovens placed up and down the country is about 386, and they usually keep them working for about six months: as therefore, each brood takes up in an oven, as under a hen, only 21 days, it is easy in every one of them to hatch eight different broods of chickens. Every Bermean is under the obligation of delivering to the person who intrusts him with an oven, only two-thirds of as many chickens as there have been eggs put under his care; and he is a gainer by this bargain, as more than two-thirds of the eggs usually produce chickens. In order to make a calculation of the number of chickens yearly so

hatched in Egypt, it has been supposed that only two-thirds of the eggs are hatched, and that each brood consists of at least 30,000 chickens; and thus it would appear that the ovens of Egypt give life yearly to at least 92,640,000 of these animals.

This useful and advantageous method of hatching eggs has been lately discovered in France by the ingenious Mr. Reaumur; who, by a number of experiments, has reduced the art to certain principles. He found, by experience, that the heat necessary for this purpose is nearly the same with that marked 32 on his thermometer, or that marked 96 on Fahrenheit's. This degree of heat is nearly that of the skin of the hen, and, what is remarkable, of the skin of all other domestic fowls, and probably of all other kinds of birds. The degree of heat which brings about the developement of the cygnet, the gosling, and the turkey-pout, is the same as that which fits for hatching the canary-songster, and, in all probability, the smallest humming-bird: the difference is only in the time during which this heat ought to be communicated to the eggs of different birds; it will bring the canary bird to perfec-

tion in 11 or 12 days, while the turkey-pout will require 27 or 28,

After many experiments, Mr. Reamur found, that stoves heated by means of a baker's oven, succeeded better than those made hot by layers of dung: and the furnaces of glass-houses and those of the melters of metals, by means of pipes to convey heat into a room, might, no doubt, be made to answer the same purpose. As to the form of the stoves, no great nicety is required. A chamber over an oven will do very well. Nothing more will be necessary but to ascertain the degree of heat; which may be done by melting a lump of butter of the size of a walnut, with half as much tallow, and putting it into a phial. This will serve to indicate the heat, with sufficient exactness: for when it is too great, this mixture will become as liquid as oil; and when the heat is too small, it will remain fixed in a lump: but it will flow like a thick syrup, upon inclining the bottle, if the stove be of a right temper. Great attention therefore should be given to keep the heat always at this degree, by letting in fresh air if it be too great, or shutting the stove more close if it be too small: and that all the eggs in the

stove may equally share the irregularities of the heat, it will be necessary to shift them from the sides to the centre ; and thus to imitate the hens, who are frequently seen to make use of their bills, to push to the outer parts those eggs that were nearest to the middle of their nests, and to bring into the middle such as lay nearest the sides.

Mr. Reaumur has invented a sort of low boxes, without bottoms, and lined with furs. These, which he calls *artificial parents*, not only shelter the chickens from the injuries of the air, but afford a kindly warmth, so that they presently take the benefit of their shelter as readily as they would have done under the wings of a hen. After hatching, it will be necessary to keep the chickens, for some time, in a room artfully heated and furnished with these boxes ; but afterwards they may be safely exposed to the air in the court-yard, in which it may not be amiss to place one of these artificial parents to shelter them if there should be occasion for it.

As to the manner of feeding the young brood, they are generally a whole day after being hatched, before they take any food at all ;

and then a few crumbs of bread may be given them for a day or two, after which they will begin to pick up insects and grass for themselves.

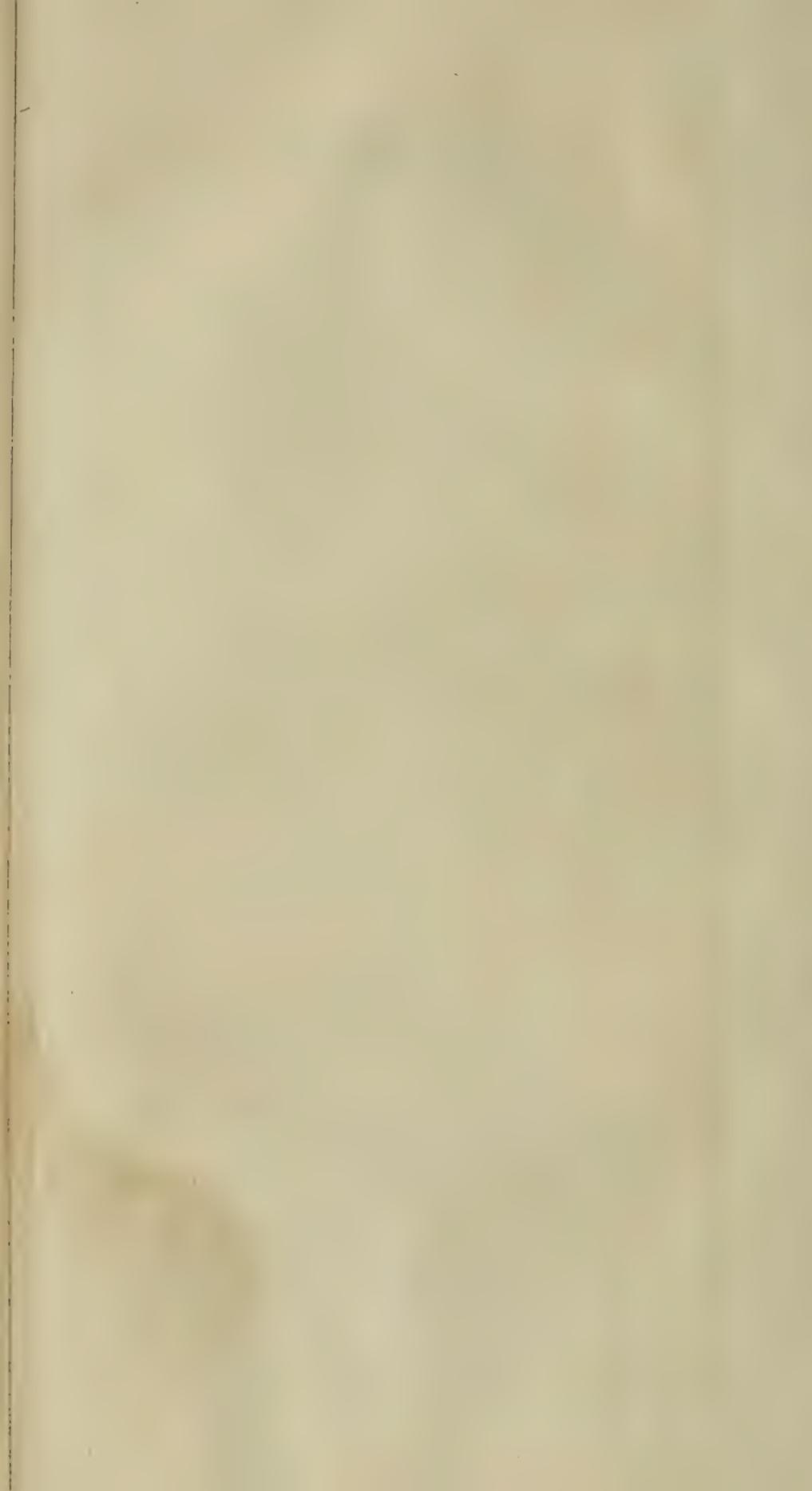
But to save the trouble of attending them, capons may be taught to watch them in the same manner as hens do. Mr. Reaumur assures us, that he has seen above 200 chickens at once, all led about and defended only by three or four such capons. Nay, cocks may be taught to perform the same office ; which they, as well as the capons, will continue to do all their lives after.

A mind harmonized by the contemplation and study of the works of Nature, will receive a considerable degree of pleasure from an attention to the progress of the chick during incubation, but for this purpose a previous knowledge of the anatomical structure of an egg will be required. The containing parts of an egg, are, 1. The shell ; 2, A membrane, of a pretty strong texture, lying next the shell ; 3. Another membrane, of a slighter texture, lying over that ; and, 4. A thin membrane, inclosing the yolk, which is twisted at its extremities, and denominated Chalazæ : The

parts contained within these, are, 1. A portion of air between the two membranes at the obtuse end of the egg ; 2. The white ; 3. The yolk ; 4. The cicatricula, in the centre of which is the speck of life. When an egg is placed under the hen, after a few days of incubation, the speck of life becomes red, and sends out its blood vessels, which are spread over the fine membrane that incloses the yolk. The white forms the nourishment of the chick, but the yolk remains entire during the whole term of incubation, being intended for the nourishment of the chick, after its exclusion from the shell. The two membranes lining the inside of the shell, supply the place of the amnion and chorion, and over their surface the umbilical vessels are spread, so that they may be considered as forming a placenta, but of a nature very different from that of a viviparous animal.

The annexed plate represents an egg on the fourth day of incubation. Fig. 1. The containing and contained parts as they appear on the removal of the forepart of the shell. Fig. 2. The shell. Fig. 3. The membranes that line the inside of the shell, and inclose the whole contents. *a.* The shell. *b.* The inner

**INSERT FOLDOUT HERE**



membrane. *c.* The cavity formed by the membranes, in which a portion of air is inclosed. Fig. 4. The white, which serves for the nourishment of the chick, during incubation, a provision absolutely necessary for an animal inclosed in a hard shell. A viviparous animal requires no such provision, its support being derived from the maternal placenta. Fig. 5. The yolk, with the speck of life and its umbilical vessels. *a.* The yolk. *b.* The Cicatricula, containing the speck of life, which at this time appears a mishapen and imperfect animal. *c. c.* The Chalazæ, or twisted extremities of the membrane that surrounds the yolk. If we compare these Chalazæ to the extremities of an axis passing through the yolk, that sphere will be found to be composed of two unequal portions, its axis not passing exactly through its centre. And as the Cicatricula with the speck of life, is always placed on the side of the smaller portion, it follows, that in all positions of the egg during the early part of incubation, it must be uppermost, and consequently nearest the hen, for the yolk is a body specifically heavier than the white with which it is surrounded. A viviparous animal has a communication with its mother, by means of a placenta and umbilical vessels, but

the oviparous animal has no such communication, being confined within a hard, but perspireable shell. Contrary to the disposition of the viviparous animal, the umbilical vessels belonging to the chick, pass through the white of the egg, and spread themselves over the surface of the chorion and amnion, thereby forming an extended placenta, which, besides absorbing the albumen for the nourishment of the animal, appears to subtract something from the atmosphere, through the pores of the shell. This something may be what the lungs of breathing animals take from the atmosphere for the support of life, and which the viviparous animal, during its uterine confinement, receives from its mother. Similar to what is observed in viviparous animals, the umbilical vessels of the chick, form a cord, consisting of two arteries and a vein; but as the animal has no apparent navel, I conceive that the cord passes from the body to the cloaca, after which it spreads its vessels over the surface of the chorion and amnion, which, as before observed, perform the office of a placenta. But of this I am doubtful.

During incubation, the yolk is not consumed by the chick, but remains entire within the

body of the animal, till within a short time of its exclusion from the shell, when it passes slowly through a small duct, into the small intestines, to serve for nutriment to the chick, at a time when neither its own industry, nor the attention of its mother, could afford a sufficient supply.

In this manner we observe the attention of Providence to the infancy of animal life, but our wonder is turned into adoration when we see the same goodness continued through all the stages of animal existence. It is in the form of instinct that the finger of God operates during the advanced periods of animal life; a principle that never ceases to act for the continuation of *animated* nature. Notwithstanding the great care that is taken in the preservation of animal life, it is well known that (to answer a wise purpose) it is continually suffered to pass into dissolution; but that the **SPiRiT** of man, so feelingly attached to its Creator, should suffer the same dissolution, is an opinion greatly to be condemned. The comfortable words spoken by Christ to the thief upon the cross, if received in their plain and obvious sense, cannot but have a good effect upon the morals of mankind.

The idea of an IMMEDIATE PRESENCE, as it is pleasing and comfortable to a good man, so it must be terrible and alarming to a bad one. And this being the case, it surely is ungenerous in any one to endeavour to shake and overthrow a faith that has a direct tendency to make us better. Such disquisitions, however learned, seem to intrude upon the peace of mankind, as they go to the establishment of a doctrine that has a manifest tendency to damp the hopes of the dying Christian,

It is to be lamented that there are some men, who, treading the same ground, carry their speculations beyond this point. Speculations that insensibly steal from them those hopes and fears which God has assigned as the great springs of human conduct. “Till that cruel moment when the grave closes over those we love, we cannot sufficiently admire the excellency of that religion which teaches us to look beyond it. Do they act agreeably to their own principles, who contend for the dignity of human nature, and yet believe that the soul of man—advancing daily in virtue and knowledge—aspiring after perfection—longing for immortality—cut off in the midst,

of its pursuits and wishes—shall share the same fate as the meanest reptile that crawls on the face of the earth?"

What value can be put upon the sure and certain hopes of IMMEDIATELY falling into the arms of an affectionate wife, or of drawing to our embrace a dutiful and affectionate child, sometime gone before us! The consolation is above all price, and he that robs me of it is as cruel as the man who takes from the sinking mariner the only plank on which he rests his hopes and fears \*.

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\* When the latter part of this Essay was written, the Author was suffering under the keenest sorrow that can press upon the human mind. It was no less than the lively recollection of some circumstances of the most afflicting nature. To the holy Spirit of a departed friend, and to the holy Spirits of two amiable young men, cut off in their prime of life, these reflections belong.

A. H.

## ESSAY XII.

*On the Cultivation of Parsnips and Beans in the Island of Jersey.*

WHETHER the cultivation of parsnips, on a large scale, is peculiar to Jersey and Guernsey, we cannot take upon us to say; but it is a fact, that in no other country in Europe are parsnips so generally cultivated, nor any where is so much use made of them to fatten cattle.

It is impossible to trace the period when the cultivation of this plant was first introduced amongst us. It has been known for several centuries, and the inhabitants have reaped such benefit therefrom, that for fattening their cattle and pigs, they prefer it to all the known roots of both hemispheres. The cattle fed therewith, yield a juicy and exquisite meat. The pork and beef of Jersey, is incontestibly equal, if not superior, to the best in Europe. We have observed, that the beef in summer is not equal to that in the autumn, winter, and

spring periods, when they are fed with parsnips, which we attribute to the excellency of that root.

All animals eat parsnips with avidity, and in preference to potatoes. We are ignorant of the reason, having never made any analysis of the parsnip. It would be curious, interesting, and useful, to investigate its characteristic principles ; it is certain that animals are more fond of it, than of any other root, and fatten more quickly. The parsnip possesses, without doubt, more nutritious juices than the potatoe. It has been proved that the latter contains eleven ounces and a half of water, and one *gros* of earthy substance, in a pound \*. Therefore, there only remain four ounces and five *gros* of nutritive matter. Probably the parsnip does not contain near so much watery particles : nevertheless they digest very easily in the animal's body. The cows fed with hay and parsnips during winter, yield butter of a fine yellow hue, of a saffron tinge, as excellent as if they had been in the most luxuriant pasture.

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\* French weight is understood.

Previous to speaking of the cultivation, perhaps it might be necessary to give a general idea of our method of ploughing in the island of Jersey. Some labourers plough their land three, four, and five years following, others six and seven; but most of them generally sow beans and parsnips the second year's ploughing, either after wheat or barley.

There are three modes of cultivation for beans and parsnips; 1st, with the spade; 2d, with the plough and the spade; 3d, with the small and the great plough. We shall only speak of this last method, the best and the most economical, and advantageous to the husbandman. It was first invented and practised by an intelligent farmer, about fifteen or twenty years ago. This plough, not yet sufficiently known, is of the greatest utility, either for grubbing up the ground, or ploughing deeply inwards, either to establish nurseries or plantations. The inventor deserves every thing from his country, and from mankind. If he had lived in an age, wherein merit and talents find protectors and encouragement, he would have received a reward for the invention of a plough, which is, and ever will be, of universal utility.

In the month of September, a slight ploughing and preparation is given to the field, destined for beans and parsnips the ensuing year. In this country, this work is called *briser*. In the beginning of January, the field is ploughed a second and last time, with the small and the large plough; the first traces a furrow three or four inches in depth, and the second, which follows the same furrow, covers it over with ten or twelve inches of earth, very neatly, insomuch that one would rather think it had been dug with a spade than ploughed. Before they sow, the field is left eight or ten days exposed to the influence of the atmosphere.

Straight lines must be drawn from north to south, with a gardener's rake, at four feet and a half distance; on these straight lines, nineteen inches in breadth, women plant four or five beans in rows, four inches distant from each other; when this is done, the sowing of the parsnips begins in broad-cast over the field, after which it must be well harrowed.

In five or six weeks the beans shoot out, and soon the ground will appear as if covered by  
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hedges, and similar to paths made for walking; for the spaces between the lines where the beans were planted, are as many alleys, where women and children weed with great facility. They generally weed the ground twice; this operation is done with a two-pronged fork, such as is used in gardens. The first weeding is performed at the end of April or beginning of May; then the plants must be cleared out if they are too thick; the last weeding must be done about the middle of July. The beans will be ripe in August; they must be immediately plucked up, as it is in this month that the parsnips begin to acquire size; they have little more than foliage the preceding months, on which account the beans are less prejudicial, so that you may have two crops on the same ground.

The crop of beans is not always certain. If high winds or fogs prevail when they are in flower, the produce will be scanty: but the parsnips in a manner never fail; they neither dread the inclemency of the weather, nor are affected by the hardest frosts, nor by any of those accidents which at times will instantly destroy a whole crop.

They reckon thirty *perches* of parsnips, with a little hay, will fatten an ox of three or four years old, though ever so lean ; he eats them in the course of three months, as follows : they are given at six in the morning, at noon, and at eight at night, in rations of 40lb. each ; the largest slit in three or four pieces ; but not washed, unless very much covered with earth. In the intermediate hours, at nine in the morning, two in the afternoon, and nine at night, a little hay is given. Experience has shown, that when cattle, pigs, or poultry, are fed with parsnips, they are sooner fattened, and are more bulky, than with any other root or vegetable whatever. The meat of such is most delicate and savoury. In spring, the markets are furnished with the best and fattest beef, from their feeding on parsnips.

## ESSAY XIII.

*On River Weeds as a Manure.*

AMONGST the variety of manures that have been recommended to give a stimulus to the vegetative principle in land, I do not recollect the weeds of rivers to have been mentioned by any writer on agriculture. Sea weeds have been found, by long and repeated practice, to be very efficacious in promoting vegetation; especially when reduced to putridity by mixing them in compost with lime and earth. But these can only be locally applied. The interior parts of the kingdom receive no advantage from them; but river weeds might be collected, and applied with equal, if not superior, advantage in almost every parish.

Being situated by a river, I had frequently regretted the quantity of weeds impeding the stream, and being the occasion of many little islands forming, which frequently in very rainy seasons caused floods and inundations,

destructive of convenience, and sometimes of life. To prevent this in some measure, it is usual for the weeds in common unnavigable rivers, to be cut twice in the summer months. In this practice, the occupiers of mills and of meadows are interested; the *latter* from the fear of inundations on the suddenness of heavy rains; the *former* peculiarly so to open the current, and admit the water below to pass away freely. But little care is taken to disencumber the stream, unless in some places to draw the weeds out on the banks, where they are suffered to remain as a nuisance, without any useful or profitable application. Having frequently observed this, I determined to try their effect as a manure in their green state. I therefore tried them on some garden ground, and they appeared to answer my expectation. But as this small experiment was not fully decisive, I prevailed on a neighbouring farmer to try them on one acre in a large turnip field then preparing, and on that acre entirely to omit any of the compost with which the rest of the field was manured. This he exactly conformed to, and threw the water weeds into every furrow that was at the next turn filled up by the plough. The consequence

was, that by the moisture and fermentation of the weeds, the seeds vegetated much sooner than on the rest of the field. The turnips grew quicker, and were superior both in the size of the roots and luxuriance of the leaves, so as to render the spot very conspicuous in the field.

But impartiality obliges me to remark, that in the succeeding crop, (barley) there was a perceptible inferiority to the rest of the land. Whether this proceeded from the weeds or some other cause, I cannot determine; but the success of this trial (with respect to the turnips) being decisively in its favour, induced me, in the following summer, to collect a considerable quantity of these weeds, and to lay them by the side of a common reservoir of dung, but not to incorporate them with any part of it; and when the mass was removed, it did not appear to have imbibed any of the manure. This I laid on some land of my own, similar to that on which the former experiment was made. It was ploughed in the latter end of October the same year on a pease stubble, and wheat *set* by hand upon it. The whole field was a good crop, and the part on which the weeds were laid not at all inferior to the rest, on which stable-dung had been spread.

in the usual mode of the Norfolk husbandry. Though this experiment was made as unmixed as possible, with a view to ascertain the vegetative virtue resulting from the weeds singly, (and proved by the crop being equal to those parts of the field which had been dunged) yet, I conceive, they would act with additional energy when mixed in compost with other manures. It would probably quicken their operation, and derive from them a permanency which seems most likely to result from an union of animal and vegetable salts and oils. That the weeds succeeded without mixture on a light sandy soil in the turnip-crop experiment, is evident; and as the time of their first cutting, is that of sowing turnips, it gives opportunity for thus applying them with little trouble or expense.

## ESSAY XIV.

*On the Forest of Sherwood.*

**T**HIS Forest is described, in a survey made in 1609, as divided into three parts or districts, called the North Part, the South, and the Middle Part. The North Part contains the towns of Carburton, Gleadthorpe, Worsop with Nettleworth, Mansfield Woodhouse, Clipstone, Rufford, and Edwinstowe, the hays of Birkland and Bilhagh, and the towns of Budby, Thoresby, Paverelthorp or Palethorp, and Ollerton.

The south part contains the towns of Nottingham, part of Wilford, Lenton with Radford, Sneinton, Colwick, Stoke, Carlton, Gedling, Burton with Bulcot, Gunthorp, Caythorp and Lowdham, Lambley, Arnold, Basford, Bulwell, Beskwood Park, Woodborough, Calverton and Saunterford Manor.

The middle part contains the towns of Mansfield with Plesley Hill, Skegby, Sutton,

Hucknal, Fullwood, part of Kirkby, Bidworth, Papplewick, Newstead, part of Linby, and part of Annesley.

The whole quantity of ground in the Forest, according to that survey, is as follows:—

	A.	R.	P.
Inclosures, . . . .	44839	1	10
Woods, . . . .	9486	0	24
Wastes, . . . .	35080	2	6
	89406	0	0
Clipstone Park, . . .	1583	1	35
Beskwood Park, . . .	3672	0	0
Bulwell Park, . . . .	326	3	2
Nottingham Park, . . .	129	3	9
	95118	0	6

Many of the plantations lately made upon this Forest, have names given them, with a view to commemorate the signal victories obtained by our gallant Admirals. My excellent friend, the Right Honourable Frederic Montague, has shown distinguished patriotism in this way. One of his plantations is named the *Howe Plantation*. Another is called the *Spencer Plantation*, in honour of the noble Earl

who lately presided at the head of the Admiralty, and on whose judicious naval arrangements too much praise cannot be bestowed. About a mile from these, on the right-hand side of the road, stands the *Nelson Plantation*, in honour of the splendid victory obtained over the French fleet at the mouth of the Nile by Lord Nelson. Contiguous to this is the *St. Vincent Plantation*, in commemoration of the signal victory obtained by Earl St. Vincent over the Spanish fleet. Adjoining is another plantation, in honour of Sir John Borlase Warren's gallant behaviour on the coast of Ireland, and is called the *Warren Plantation*. On the right-hand side of the coach-road to Papplewick, from Mansfield, is the *Duncan Plantation*, in honour of the victory gained by Lord Viscount Duncan over the Dutch fleet.—In these plantations, pillars are erected, with inscriptions.

Since this survey, many extensive inclosures have been made, and much waste land has been planted by the Duke of Portland and other proprietors, to whose patriotism this nation is much indebted. The time will come, when these oaks will be venerated by posterity, as monuments of British valour, success-

fully exerted in every part of the habitable globe, in defence of the happiness and liberties of mankind. The illustrious Linnæus styled our happy island the “Punctum Vitæ in Vitello Orbis.” A compliment that Rome, in the meridian of her glory, never deserved.

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## ESSAY XV.

*On the Encouragement to be given by Landlords to their Tenants.*

THE advice and premiums given by the Society of Arts in London, together with the honourable exertions made by other societies in the country, have greatly contributed to the advancement of agriculture; and were country gentlemen to exert themselves in giving instruction and encouragement to their own respective tenantry, after the manner of my much respected friend, Thomas Johnes, Esq. of Hafod, in Cardiganshire, we should

soon see the beneficial effects of such a proceeding even in the most sequestered places of this our happy island. In the year 1800, Mr. Johnes published a small volume containing advice to his tenants, with a selection of such Agricultural observations as applied to the parts of husbandry in which his tenants were most deficient. Such a proceeding is worthy of imitation, and is as follows:

#### ON CROPS.

Upon the proper rotation of crops depends the well-doing of the farmer. This doctrine I am very anxious to imprint in your minds, for in this country the course of crops is most miserably neglected; or rather there is only one continuation of oats until the ground is completely exhausted. There is scarce an idea of a meliorating green crop, or a proper fallow, between the crops of grain.

As I am determined by rewards and otherwise, to put an end to this destructive system, I shall very plainly open my mind to you.

In all the Leases, I grant there will be a clause to prevent this destructive practice from

being continued, which shall be religiously kept; on the contrary, I shall not forget to reward those who follow a better system. I shall not dwell longer on so disagreeable a subject, but point out what I think a good course of crops, which must be varied according to the difference of the soils.

**TURNIPS** drilled.

**BARLEY** with Red Clover.

**CLOVER**, second crop ploughed in, in the Autumn.

**WHEAT**.

**PEASE** manured.

**OATS**.

**TURNIPS**.

I consider the turnip crop as essential to every good farmer, and if sown as recommended, in Drills, they will scarce ever fail. You can then horse-hoe them at a trifling expense, and any children can thin them in the rows. The drill method saves three-fourths of manure, and answers more effectually.

Estimating the value of a turnip-crop as highly as I do, I shall lay it down as a rule that no tenant shall be entitled to any pre-

mium from me for the management of his farm, who has not first acquired a premium for a turnip-crop.

PREMIUMS for TURNIPS on not less than  
Four Acres.

For the best Crop of thrice-hoed Turnips,  
Five Guineas.

For the next best,  
Three Guineas.

For the next,  
Two Guineas.

A preference will always be given to those sown in drills—provided, in other respects, the crops are equal. The fields must be perfectly well fenced.

Quality, not quantity, will be looked to; and also to the size of the Farm.

These Premiums will be continued every year—and those who intend to apply for them, must give me notice in writing before the 12th of September. Should none of the crops appear deserving of reward, it will be with-

held, and added to the premiums of the year following.—The same tenant not to receive the first premium three successive years.

THOMAS JOHNS.

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## ESSAY XVI.

### *On the Preparation and Use of Peat Compost.*

AS a quantity of land in my farm wanted draining, I had occasion for a large main-drain for that purpose; in the cutting thereof I found a quantity of earth, in a solid bed, resembling peat, but of a more solid substance than peat generally is. I threw it into heaps, and, after the ochery water had left it, mixed it with lime, which appeared to me to form with it an excellent manure. After this, I fallowed a field of a gravelly soil, drilled it for potatoes, and put the same quantity of this compost into the drills, as I should otherwise

have done of black dung ; and the produce from eight statute acres was 864 loads, of thirteen score to the load. I then ploughed it for wheat, and had a most excellent crop ; sowed it with white clover and grass seeds, and let it lie for grass ; it has been, and is now, one of the best pastures in the neighbourhood. The land, before the improvement, was worth about 1l. 10s. an acre, and, after taking two very great crops from it, is now worth about 3l. per acre. The general opinion of the country was against the use of lime, in the setting of potatoes : it has, however, answered beyond expectation ; and had I been under the necessity of procuring dung for my potatoes, instead of this compost, it would have cost me six times as much money.

Having made the above experiment with potatoes and wheat, I was inclined to try the same sort of compost upon grass-lands. In a little valley between two small hills in my farm, I found a very large bed of peat, composed of decayed vegetable substances, which was boggy, and in some places upwards of nine feet in depth. This I drained, and drew off the stagnant water with which it was filled : it appeared to me the whole bed, in

consequence of being laid dry, had fermented ; for when we afterwards cut it, we found it converted to very fine mould. I caused it to be trenched to the next stratum, which was marl, and mixed with lime hot from the kiln ; but very soon found that I must slack the lime before mixing, or it would have burnt it to ashes, by undergoing a fresh degree of fermentation. The quantity I mixed was nine thousand tons, with 1327 horse loads of lime, which cost me about 160l. and I gave one penny per cubic yard for the trenching and mixing : and having about thirty acres of gravelly soil, I begun in October to cover my land with this compost, which, in a very short time, proved advantageous ; for the grass began to spring as if it had been April, and soon produced a very luxuriant pasture of about four acres in extent. This I covered first, and turned into it eight milch cows, about the 15th of December. They fed thereon till the 1st of March, and gave me a very great quantity of milk and butter ; and the butter was rich and yellow, like spring butter. The cows, while in this pasture, had very little hay, and that during the night, of which they would eat only a very few pounds. Since I took out my cows, I have pastured the land

with twenty in-lamb ewes, of the large white-faced, or Malham-breed. They are now pasturing ; and I doubt not but it would feed sheep very fat. I have now covered about twenty-six acres more, which promise to be as successful as the other, and amounting to, in the whole, thirty acres. This, prior to the improvements, was worth 2l. 10s. per acre, and is now worth 4l. per acre.

This compost, is, I believe, equal to the best manure I could obtain, and the advantage arising from peat compost with lime, when laid upon gravel, sandy, or clay soils, is almost invaluable. The quantity of this compost which I have now ready prepared, together with what I have used, amounts to nine thousand tons, which has been raised since last summer ; and the total expense is 530l. The quantity per acre is one hundred and forty tons, which cost me about 8l. per acre. Had it been dunged the common way, it would have cost me sixteen guineas per acre, and would not have answered so well. The remainder of my compost is upwards of four thousand tons ; I have thirty acres more to cover, the greatest quantity of which I intend to plant with potatoes. By the statement

above, will be seen the annual value of the land at present, and what its value was prior to those improvements.

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## ESSAY XVII.

*On Cattle.*

THE object that every intelligent farmer ought to have in view, who breeds and maintains domestic animals, is *profit*; consequently he ought to find out, as Bakewell happily expressed it, “*the best machine for converting herbage, and other food for animals, into money.*”

For that purpose, it is necessary to ascertain the shape and nature of the animal, which makes the most profitable use of the food it eats; that, however, must depend much on the price of the different articles which the animal produces. For instance, tallow for-

merly bore a higher price than meat, and consequently was a greater object in the breeding of cattle and sheep than at present, when it sells at an inferior price \*. Milk, and the various articles produced from it, have become so valuable, as to render a good dairy cow the most profitable of all our domestic animals, and consequently entitled to peculiar attention†. Meat, however, is at present the object most generally attended to; and it is certain, that the breeding of cattle and sheep for the shambles was never carried to such

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\* It would be a curious and important subject of inquiry, to endeavour to ascertain the real price, *and the relative value*, of beef, tallow, and leather, at different periods, more especially within the last century. It is evident, that the farmer must always aim at producing those articles which will yield him the greatest profit; and, at present, flesh must be the object; for my butcher informs me, that on the day on which this note is written, (25th January, 1802,) beef is sold at  $9\frac{1}{2}$ d. per lb. and tallow at  $5\frac{3}{4}$ d. per lb. or 3s. 11d. per stone. Flesh consequently is, to tallow, as 38. is to 23. It is therefore for the advantage of the farmer, as the market now stands, to produce flesh rather than tallow.

† It is much to be regretted, that the real value of a good dairy-cow is not more generally known. I am assured by a most respectable country gentleman, (Walter Trevelyan, Esq. of Nether Witton, in Northumberland,)

perfection as it has lately been brought to in England.

The cause of this, it may not be improper briefly to explain.

Stock, in general, (and this is still the case in a multitude of instances, and must always be so when the breeder has not food at command calculated for fattening, as well as rearing his cattle,) was formerly bred by one set of men ; fattened, or prepared for the market,

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that a well-bred Teeswater cow will give, on an average, 14 quarts at each of two milkings, or 28 quarts per day. Some of the Teeswater breed, according to Culley, (p. 40.) give even to the amount of 36 quarts per day. But calculating at 28 quarts, this, at 4d. per quart, amounts to 9s. 4d. per day, and in six months to 8*l.* Another intelligent gentleman, (one of the representatives of Ireland in the Imperial Parliament,) who has had great experience in cattle-farming, observes, that any cow, at all calculated for the dairy, will, in seven months milking, pay double her price to the butcher. Take, for example, an Irish or Scots cow, calving in May, and value the grafts she eats at 3*l.*; if she gives from 10 to 12 quarts per day, the farmer will not only be indemnified for attendance, rent, &c. but, at the end of the season, he will have the cow for nothing. Can there be a greater inducement to dairy-farming?

by a second ; and killed by a third \*. Whilst these three occupations continued distinct, with only occasional communications or intercourse with each other, no great improvement could be effected. That division of labour, or separation of professions, so useful in manufactures, was pernicious to this important branch of agriculture, by preventing the principles, on which the improvement of our domestic animals might be effected, from being ascertained †.

A person, however, of strong natural sagacity, (Robert Bakewell, of Dishley, in the county of Leicester,) though he did not unite to the extent that his disciple, Culley, has done, the two distinct occupations of breeder and grazier ; yet having acquired great skill in grazing, by preserving his breeding-stock

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\* The intermediate occupation of drovers, salesmen, &c. have no occasion to acquire any peculiar knowledge, (excepting as to the state of the markets in various parts of the kingdom,) different from that of the other professions above mentioned.

† But when the properties essential in forming a perfect breed, are fully ascertained, the separation of occupations, above alluded to, will become useful, as one farm may be better calculated for breeding, another for fattening, &c.

in the highest possible condition, and having called in to his aid all the skill and experience which the butcher had acquired, was thus enabled to ascertain the principles, not only of breeding domestic animals, so as to answer the common expectations of the farmer, but also of bringing them to a degree of perfection, of which, before his time, they were scarcely supposed capable: and, by directing the public attention in general, and that of the farmer in particular, to the art of breeding, he has, in various respects, most essentially benefited his country. By his example, that most important system was very generally established, of certain breeders directing their whole attention to the rearing of males, and letting them for the season at such prices as would amply indemnify the breeder for all the care and expense he had bestowed upon them; a practice which had originally taken place in Lincolnshire, but had never been carried to any great height till adopted by Mr. Bakewell.

In discussing the important subject of cattle, it is proper, in the first place, to observe, that a distinct breed of cattle may be formed, 1st, In consequence of the soil of the country, and the vegetables it produces; 2d, From the cli-

mate, which, in various respects, must affect the animals living under its influence; 3d, From a particular shape, size, or colour, becoming fashionable, and consequently in great demand; 4th, From the nature of the animals that may be imported into it from other counties; and, 5th, From the various crosses which have been made among breeds in some respects distinct, and from which a new variety may arise.

It is not proposed, however, to attempt any particular enumeration of the various breeds in these kingdoms; for, though differing in regard to colour, size, &c. they claim, in many respects, the same valuable properties. The great object, therefore, to ascertain, is, what particulars are essential to form a perfect breed; because, if these are once pointed out, there is no sort that may not be improved by attentive breeders, either by crossing with other stock, or by selecting the best specimens of the breed itself, so as to acquire the qualities that may be wished for. These particulars may be considered under the following general heads, namely, 1st, Size. 2d, Shape. 3d, Disposition. 4th, Hardiness. 5th, Aptitude to feed. 6th, Early maturity. 7th, Milk. 8th, Quality of Flesh. 9th, Fat. 10th, Hide. And, lastly, Fitness for working.

1st, *Size.* It is difficult to lay down any general rule for the size of cattle, as so much must depend on the nature of the pasture, and on the means which the grazier has for ultimately fattening them ; nor has it yet been proved, by decisive and repeated experiments, whether the large or the small sized pay best for the food they eat. The experiments ought to be made with similar breeds, but of different sizes ; and the particulars to ascertain, are, whether it does not require a much greater quantity of food, 1st, to rear a great ox, than a small one ; 2d, to feed him when working ; and, 3d, to fatten him afterwards. A large calf certainly requires more milk than a small one ; but if it pays as well for what it consumes, or grows in proportion to what it takes, there is no objection, on that account, on the score of profit ; nor if a large ox eats more, provided he works proportionally more than a small one. In regard to fattening, the experiments of Lord Egremont are rather favourable to the opinion, that fattening stock do not eat in proportion to their weight, but that a small ox, when kept in a stall, will eat proportionally more, without fattening quicker than a large one.

Without pronouncing decisively on a question so much contested, as whether large or small cattle ought to be preferred, (which will require, indeed, a great number of experiments finally to determine,) I shall endeavour shortly to sum up the arguments made use of on both sides.

In favour of small or moderate sized cattle, it is contended, 1st, That a large animal requires, proportionally, more food than two smaller ones of the same weight. 2d, That the meat of the large animal is not so fine grained, and consequently does not afford such delicate food. 3d, That large animals are not so well calculated for general consumption as the moderate sized, particularly in hot weather. 4th, That large animals poach pastures more than small ones. 5th, That they are not so active, consequently not so fit for working. 6th, That small cows, of the true dairy sort, give proportionally more milk than large ones. 7th, That small oxen can be fattened with grass merely, whereas the large require to be stall-fed, the expense of which exhausts the profit of the farmer. 8th, That it is much easier to procure well-shaped and kindly-feeding stock of a small size, than of a large one. 9th, That

small sized cattle may be kept by many persons, who cannot afford either to purchase, or to maintain large ones. And, lastly, If any accident happens to a small sized animal, the loss is less material \*.

In favour of the larger sized, it is on the other hand contended, 1st, That without debating, whether, from their birth till they are slaughtered, the large or the small ox eats most for its size, yet that, on the whole, the large one will ultimately pay the farmer as well for the food it eats. 2d, That though some large oxen are coarse grained, yet that where attention is paid to the breed, the large ox is as delicate food as the small one. 3d, That if the small sized are better calculated for the consumption of private families, of villages, or of small towns, yet that the large ox is fitter for the markets of large towns, and in particular of the metropolis. 4th, Even admitting that the flesh of the small sized ox is

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\* There are a number of important observations on the size of cattle, in Dr. Anderson's *Recreations*, vol. iii. p. 1.; and, on the subject of the dairy p. 161. 241. 321. 401. and vol. iv. p. 1, and 81.

better when eaten fresh; yet the meat of the large sized is unquestionably better calculated for salting; a most essential object in a maritime and commercial country; for the thickest beef, as Culley justly remarks, (p. 47.) by retaining its juices when salted, is the best calculated for long voyages. 5th, That the hide of the large ox is of infinite consequence in various manufactures. 6th, That where the pastures are good, cattle will increase in size, without any particular attention on the part of the breeder; which proves that large cattle are the proper stock for such pastures. 7th, That the art of fattening cattle by oil-cake, &c. having been much improved and extended, the advantage thereof would be lost, unless large oxen were bred, as small ones can be fattened merely with grass and turnips. And, lastly, That large cattle are better calculated for working than small ones, two large ones being equal to four small ones, in the plough or the cart.

Such are the arguments generally made use of on both sides of the question; from which it is evident, that much must depend upon pasture, taste, markets, &c. But, on the whole, though the unthinking multitude

may admire an enormous bullock, more resembling an elephant than an ox, yet the intelligent breeder (unless his pastures are of a nature peculiarly forcing), will naturally prefer a moderate size for the stock he rears; or, perhaps, may adopt that plan of breeding, according to which, the males are large and strong, and the females of a small size, yet not unproductive to the dairy \*.

2d, *Shape* †. It is extremely desirable to bring the shape of cattle to as much perfection as possible; at the same time, profit and utility ought to be more attended to than mere beauty, which may please the eye, but will not fill the breeder's pocket, and which, de-

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\* See Mr. Knight's valuable account of the Herefordshire Breed: *Communications to the Board of Agriculture*, vol. ii. p. 172. The Herefordshire, Devonshire, and Sussex, resemble each other much in this respect.

† It is a common saying with farmers, ‘*that all breed goes in at the mouth*;’ and it is certain, that no animals can be well shaped, unless they are well fed, both in summer and winter. It is almost incredible, how much the same breed will improve, when they are better taken care of. That, however, ought neither to prevent selection, nor judicious crossing.

pending much upon caprice, must be often changing.

As to the shape of cattle, however, breeders seem to concur, in regard to the following particulars, *to wit*, 1st, That the form ought to be compact, so that no part of the animal should be disproportioned to the other. 2d, That the carcase should be deep. 3d, Broad. And, 4th, That the head, the bones, and other parts of little value, should be as small as possible.

It is evident, however, that the form ought to be adapted, as much as possible, to the wishes of the consumer. For instance, if cattle are to be sold in London, or in other places where beef for rump steaks is much in demand, and sells higher than any other parts of the carcase, that is an object to be attended to in cattle bred for the Smithfield or any similar market, which would not be essential in other counties, where no such distinction is made in the meat that is consumed.

3d, *Disposition*. It is of great importance, to have a breed distinguished by a tame and docile disposition, without, however, being

deficient in spirit. Such a breed is not so apt to injure fences, to break into other fields, &c.; and, unquestionably, less food will rear, support, and fatten them. As tameness of disposition is much owing to the manner in which the animal is brought up, attention to inure them early to be familiar and docile, cannot be too much recommended.

4th, *Hardiness*. In the wilder and bleaker parts of the country, hardiness of constitution is a most important requisite; and even where stock is best attended to, it is of essential consequence that they should be as little liable as possible to disease, or any hereditary distemper; as being *lyery*, or black-fleshed \*, or having yellow fat †, and the like. It is a popular belief, that a dark colour is an indication of hardiness; and that cattle with light colours are softer, and more delicate. A rough pile is also reckoned a desirable property in a Highland breed; and, above all, in *out-winterers*, as they are called, or cattle kept out all winter,

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\* Culley on Live Stock, second edition, p. 43. It is singular, that these black fleshed animals have little or no fat, within nor without.

† See Middleton's Middlesex, p. 576.

those who will face the storm, and not those who will shrink from it, are in request\*.

5th, *Easily maintained.* It is well known, in the human race, that some individuals eat a great deal, and never get fatter; whilst others, with little food, grow immoderately corpulent. As the same takes place, in regard to cattle and to other animals, it is evident how important it must be to ascertain the circumstances which produce a property so peculiarly valuable in them. Bakewell strongly insisted on the advantage of small bones for that purpose; and the celebrated John Hunter declared, that small bones were generally attended with corpulence, in all the various subjects he had an opportunity of examining. It is probable, however, that a tendency to fatter arises from some peculiar circumstance in the internal structure of the body, of which, small bones is, in general, an indication; and that it is only in this point of view that they ought to be considered essential; for they often weigh as heavy, and consequently re-

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\* It is remarked in the Highlands, that, in bad weather, hardy cattle keep their back bones straight, whereas soft ones bend them.

quire as much nourishment as large ones. Small bones, like those of the blood horse, being compact and heavy: large bones, like those of the common dray, or cart-horse, being extremely porous, and, consequently, light for their apparent bulk. Indeed, cattle ought not only to be easily maintained, in point of quantity, but, in remote and uncultivated districts, in regard to the quality also of the food they consume; and it is certain, that some particular animals will fatten as well on coarse fare, as others will do on the most luxuriant.

5th, *Early maturity*. Arriving soon at perfection, is a material object for the breeder, as his profit must, in a great measure, depend upon it. This is a circumstance, indeed, not only extremely material to the farmer, but, in a populous country, where the consumption of meat is great, to the public also, as it evidently tends to furnish greater supplies to the market. In regard to this point, however, some wish to make a distinction between sheep and cattle; as the latter, they affirm, might pay for its keep, by working, or by milk. But, is not the farmer indemnified for the expense of maintaining sheep, by the valuable manure

it yields, and the fleece which it annually produces, which, when manufactured, is the source of such profit to the community \*?

7th, *Milk.* The dairy is such an object, in many parts of the kingdom, and it is so desirable to have a living machine that can convert, in abundance and perfection, the food it eats, to so useful, so profitable, and so essential an article, as milk, that the breed the most distinguished for that property must always be in request. Whether a particular breed ought to be kept up for that sole purpose, or whether it is preferable to have stock partly calculated for the butcher, and partly for the dairy, is a point well entitled to the most deliberate discussion. It is probable, that, by great attention, a breed might be reared, the males of which might be well calculated, in every respect, for the shambles ; and the females of

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\* Both sheep and cattle arrive sooner at maturity, when they are fed in such a manner as to keep them constantly in a growing state : In that way, they make more progress in three years, than they usually do in five, when they are half starved during the winter, and their growth checked, which it certainly is every winter, in the ordinary way of rearing.

which might, when young, produce abundant quantities of good milk, yet, when they reached eight or nine years of age, might be easily fattened. This would be the most valuable breed that could be propagated in any country; and, indeed, some of the best English and Scottish breeds have almost reached that point of perfection.

8th, *Quality of Flesh.* The quality of the flesh must certainly depend much upon age and sex, as old cattle must have firmer flesh than young, and heifers must be finer grained than oxen. The excellence of the meat, also, must depend much upon the size of the animal, and the food on which it is fattened. On the whole, however, there is no better sign of good flesh, than when it is *marbled*, or the fat and lean nicely interwoven, and alternately mixed with each other. Some of the Scottish breeds, (the more northerly in particular), when properly fed, and when they arrive at a proper age, enjoy this quality in great perfection; and hence, there cannot be either wholesomer food, or more delicious eating.

9th, *Fat.* The advantages, or disadvantages, of fattening cattle and sheep, at least to the

extent usually practised at present, is a point that has, of late, attracted much public attention. But any controversy upon that subject, must necessarily arise from want of proper discrimination. Fat meat is generally accounted more nourishing than lean ; but then none, except persons in the most vigorous state of health, can digest it : consequently, it is unfit for general consumption. Dr. Willich, in his *Lectures on diet and regimen*, very justly observes, “ that though fat meat is more “ nourishing than lean, (fat being the cellular “ substance of animal jelly), yet to digest this “ oily matter, there are required, on account “ of its difficult solubility, a good bile, much “ saliva, and a vigorous stomach\*.” Fat meat also, unless prepared with peculiar care, is apt to lose much in cooking ; but there are modes by which no loss is sustained in dressing it, which remove that objection. For instance, the keelmen of Newcastle purchase great quantities of fat meat. Being generally of

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\* Willich's *Lectures on Diet and Regimen*, third edition, p. 316. Dr. Stark's experiments go to prove, that three ounces of the fat of boiled beef is equal to a pound of lean. See a tract printed anno 1801, entitled, “ *Practical Economy*,” &c.

Scottish extraction, they follow the custom so usual in Scotland, of boiling their meat ; the broth of which feeds the family, whilst they themselves eat the meat, generally in a cold state, and in great quantities ; and are thus enabled to go through the heavy labour they usually undergo. In many districts, manufacturers and others bake their meat with potatoes under it, and the fat, melted by the fire, falls upon the potatoes, and improves much their taste and the nourishment to be derived from them. In either of these ways, little, if any, of the substance of the meat is lost. But, according to the usual mode of boiling or roasting fat meat, the loss is considerable, and the meat itself is far from being well calculated for nice or delicate stomachs. The art of fattening animals, however, is one that seems fit to be encouraged, as likely to promote useful knowledge ; and although, in the course of trying a number of experiments, some excesses may be committed, yet, on the whole, much advantage must be derived from them.

10th, *Hide*. It is well known, that the grazier and the butcher judge of the aptitude

that any animal has to fatten, from the touch of the skin. When its hide feels soft and silky, it strongly indicates a tendency in the animal to take on meat; and it is evident, that a fine and soft skin must be more pliable, and more easily stretched out to receive any extraordinary quantity of flesh, than a thick or tough one. At the same time, thick hides are of great importance in various manufactures. Indeed, they are necessary in cold countries, where cattle are much exposed to the inclemency of the seasons; and, in the best breeds of Highland cattle, the skin is thick, in proportion to their size, without being so tough as to be prejudicial to their capacity of fattening. It appears from Columella's description of the best kind of ox, that the advantage of a soft skin is not a new discovery, but was perfectly well known to the husbandmen of ancient Italy.

Lastly, *Working*. It is a most important question, not yet finally ascertained, whether the public, or the individual, gain by working oxen\*. It is more than probable,

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\* It is ingeniously remarked, that the working of oxen must necessarily increase the number, and only suspends

that the husbandman, who has an inconsiderable capital, and little work to do, may find it for his interest, as they are cheaper to rear and to maintain, and will always fetch something. But the great farmer, who has constant occupation for his teams, and a sufficient capital to act upon, will generally find it advisable, though he may employ oxen for some purposes, yet, on the whole, to use horses. At the same time, the population of

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the consumption. In the Survey of Northumberland, by Mefsrs. Bailey and Culley, some calculations will be found extremely unfavourable to the working of oxen. In fact, it is a general and complicated subject; as the question is not, whether oxen, or horses, can be worked at the least expense, but whether, by working horses, and feeding oxen, more butcher meat will not be sent to the market? as oxen, when not worked, may be ready for consumption so much earlier than otherwise can possibly be effected. In favour of oxen, it is to be observed, that a ruminating animal will be served with one-third less food than another of equal bulk that does not possess that property. The reason is, that ruminating animals have stronger digestive organs, and every thing capable of being converted into chyle, or nourishment, is extracted from the food. But a horse's stomach is not fitted for this; so that a greater quantity of food is necessary to extract the same nourishment. See *White, on the Natural History of the Cow, Manchester Memoirs, Vol. i. p. 442.*

a country may increase so much, that the ground must be cultivated either by the hands of man, as in China, or by animals which man will eat; and the price of beef may become so high, as to cast the balance in favour of oxen. On these grounds, it is desirable that the general breed of cattle in a country should be capable of working. Indeed, as stock ought to produce something, even when rising to their full growth, if oxen are not to be worked, cows ought to be more generally kept, as the produce of their milk is so profitable, unless where pasture is of little value, as in Wales, or the mountainous districts of Scotland and Ireland.

These short hints contain the substance of what has occurred to me on the principles of breeding cattle; and the result is, that cattle ought to be,

1st, Of a moderate size, unless where the food is of a nature peculiarly forcing.

2d, Of a shape the most likely to yield profit to the farmer.

3d, Of a docile disposition, without being deficient in spirit.

4th, Hardy, and not liable to disease.

5th, Easily maintained, and on food not of a costly nature.

6th, Arriving soon at maturity.

7th, Producing considerable quantities of milk.

8th, Having flesh of an excellent quality.

9th, Having a tendency to take on fat.

10th, Having a valuable hide; and

*Lastly*, Calculated (should it be judged necessary) for working.

## ESSAY XVIII.

*On the Aphid, and Blights on Fruit Trees.*

SO many writers on gardening, and on general agriculture, have treated on blights, and so many different theories have been offered to the public, that the subject may appear to many to have been already sufficiently investigated.

What are usually termed blights, in the vague and extensive signification of that word, appear to me to originate from three distinct causes:—From insects, from parasitical plants, and from unfavourable seasons.

The destructive effects of the *Aphis* on wall-trees are so well known to every gardener, as scarcely to require description. The leaves curl up, the fruit drops off, and the progress of vegetation is almost totally suspended. Much ill-applied labour is often used by the gardener to destroy these insects, though they are not very tenacious of life. Another more

extensive, but less fatal disease in plants, the honey-dew, is produced by this insect (as described by the Abbé Boissier de Sauvages). It has, however, been contended, that the honey-dew is not produced by the *Aphis*, but that it is a morbid exudation from the plant; at least that there are two kinds of it; because the leaves are often covered with honey on trees where the *Aphis* is not found, and because the *Aphis* is sometimes found without the honey-dew. But to this it may be objected, that honey, not being a volatile substance, will remain on the leaves, till it be washed off by the rain; and, when moistened by the dew, will leave the appearance of a recent exudation; and that the *Aphis* certainly does not afford honey at any period of its existence. I have frequently placed plates of glass and of talc under the leaves of fruit-trees, on which different species of the *Aphis* abounded, and I have found these substances to be in a few hours covered with honey: and I have at other times distinctly seen the honey fall from the under-sides of the leaves, where these insects abounded, by the following means. Having placed a small branch, containing a numerous colony of insects, in the window of my study, where the sun shone strongly upon it, I closed

the shutters so as to exclude all the light, but that which fell directly on the branch. In this situation the descending drops of honey became extremely visible by refraction, and appeared evidently to be emitted from the insect with considerable force. Each drop contained many minute white points, which I considered as the eggs of the *Aphis*; but as I knew that the modes of generation in this singular insect had much engaged the attention of naturalists, I did not examine with sufficient attention to decide that point. This species of insect appears to require a previous disposition in the tree to receive it; and its first attacks may thence be considered as symptomatic of a previous ill habit in the tree: for I have found that trees which have lately been transplanted, have totally escaped its attacks, when every other tree of the same kind of fruit, growing in the same situation, has been nearly destroyed. And I can assert, from many experiments, that if every peach and nectarine-tree was to be dug up once in every five or six years, and to be replanted with some fresh mould round the roots, (which should be as little injured as possible,) a much larger quantity of fruit, and of very superior quality, would be obtained. It is

unnecessary to inform the experienced gardener, that the tree should be removed early in the autumn; that its branches should be considerably retrenched, and that it should not be suffered to bear a heavy crop of fruit in the succeeding season. I have never found any species amongst the numerous and prolific genus of the *Aphis*, which was not readily destroyed on the wall-tree by covering it with a sheet of canvas, and under that introducing the smoke of tobacco. It is, however, necessary that the fumigation should be repeated twice or thrice, with intervals of four or five days. I have often seen the addition of sulphur recommended, and have known it tried, but always with fatal consequences to the tree, as well as to the insects.

The blossoms of apple and pear-trees are often said by farmers to be blighted, when they are destroyed by insects, which breed within them, or in their fruit; and the same term is used, when the leaves have been eaten by the caterpillar; but as the insects themselves, as well as the manner in which their depredations are made, are extremely obvious, they do not properly come under our observation when treating of blights.

The species of parasitical plants which are found in the form of disease on other plants, appear to me greatly to exceed the number of those I have any where seen described by botanical writers. Of these the mildew is the most common and obvious. If a branch, infected with this disease, be struck by the hand in calm dry weather, a quantity of white powder will be found to fly from it; and if this be received on a plate of talc, or of glass, and examined by the microscope, it will be found to consist of very numerous oval bodies, evidently organized. There is another plant similar to this in every thing but colour (being of a tawney brown,) which is not unfrequently found on the leaves of young apple-trees. Both these plants appear to me to be evidently species of mucor; and as much the greater number of species of this genus of plants is found to flourish in damp air, and in situations deprived of light, it may be supposed that the foregoing diseases might be prevented or removed, by placing the plants at proper distances: but I have not found this to be the case. They, however, abound most in low and sheltered situations; but they are not unfrequently seen in those of an opposite kind. The red and white mould on hops, and the

black spots on stalks of wheat, (the rubigo of Virgil,) and many other diseases of plants, will, I think, be found to arise from the attacks of minute plants of this genus, which appears to me to possess qualities somewhat similar to the digestive powers of animals.

The most common and extensive causes of what are termed blights, remain still to be described, and evidently exist in the defects and sudden variations of our unsteady climate. Whatever be the cause by which the sap is raised and propelled to the extremities of trees, it is well known that its progress is accelerated by heat, and that it is checked, or totally suspended, by cold; and it has been ascertained by others, as well as by myself, and indeed is known to every experienced gardener, that a plant, under the most skilful management, does not readily recover its former vigour, when it has been injured by exposure, for a few hours, to a temperature much below that to which it has been previously accustomed. It frequently happens in this climate, when the blossoms of our fruit-trees are just expanding, that a very warm day succeeds a night whose temperature has been some degrees below the freezing point of

water. In such a day the evaporation from the unfolding leaves and blossoms will be greatly increased by the agency of heat and light, whilst the supply of nourishment is, in a great measure, cut off by the ill effects of the preceding night. The blossoms will nevertheless unfold themselves, but will be unproductive, from the want of due nourishment; whilst the hazy appearance of the air, which almost always accompanies such weather in the spring, will induce the gardener unjustly to infer that the ill effects he observes have arisen from some quality in the air (distinct from excess of heat and cold,) which he denominates a Blight.

The best defence against this kind of weather for wall-trees, that I believe has yet been tried, is a covering of a double and triple net; for by this the tree is, in some degree, protected from frost: and the excess of evaporation, in the succeeding day, is in a very considerable degree prevented. Lightning is supposed by many to be very highly injurious to the blossoms of trees; but I believe that the ill effects which appear sometimes to accompany it, may be more justly attributed to excessive heat. The careful gardener often

covers his trees with mats, or something of this kind; and by almost totally depriving the tree of light, creates that blight which he is anxious to exclude.

As the blossoms of every tree are formed during the preceding summer and autumn, they will evidently be more perfect in proportion as those seasons have been favourable, and as the management of the gardener has been judicious: and as the power of bearing unfavourable weather will be proportional to their vigour, and to the maturity of the annual wood, through which the sap passes to support them, the gardener should be (though he rarely is) extremely attentive to keep his trees in such a state, and the branches at such distances from each other, that they may receive the greatest possible benefit from the portion of light and heat which our shadowy climate affords them. It frequently happens in pruning, that too much bearing-wood is left on the tree. Every gardener ought to know, that where a hundred fruits are a sufficient crop for a tree, he has a better chance to obtain that hundred from one thousand blossoms, to which the whole nourishment of the tree is directed, than when the same quantity of

nourishment has to support a hundred thousand.

In standard fruit-trees, where no advantages can be derived from covering them, much may be done by the judicious application of the pruning-knife. The branches of a tree of this kind, ought to be much thinned towards their extremities, so that the light may be admitted into the centre of the tree; but the internal parts of it should never be so thin as to admit of a free current of air through it. When a tree has been properly pruned, blossoms and fruit will be found on every part of it; and, in unfavourable seasons, the internal blossoms will receive protection from the external branches, which will be unfruitful.

It is particularly the interest of every planter, to take care that the varieties of fruit which he plants be sufficiently hardy for the situation in which he places them; for, if this be not attended to, little benefit will be derived from the foregoing observations.

## ESSAY XIX.

*On different sorts of Lime.*

I WAS informed last summer, that in the neighbourhood of Doncaster, two kinds of lime were employed in agriculture, which were supposed to differ materially in their effects. One of these, which was procured near the town, it was necessary to use sparingly, and to spread very evenly over the land; for it was said that a large proportion of it, instead of increasing, diminished the fertility of the soil; and, that wherever a heap of it was left in one spot, all vegetation was prevented for many years. Fifty or sixty bushels upon an acre, were considered to be as much as could be used with advantage. The other sort of lime, which was obtained from a village near Ferry-bridge, though considerably dearer, from the distant carriage, was more frequently employed, on account of its superior utility. A large quantity was never found to be injurious; and the spots

which were entirely covered with it, instead of being rendered barren, became remarkably fertile. The different properties ascribed to these two kinds of lime were so very distinct, that it seemed probable they could not be imaginary; and it therefore appeared to be worth the trouble of ascertaining them more fully, and of attempting to discover the nature of the ingredients from whence the difference arose. For this purpose, I procured some pieces of each sort of limestone, and first tried what would be their effect upon vegetables, in their natural state, by reducing them to coarse powder, and sowing in them the seeds of different plants. In both kinds, the seeds grew equally well, and nearly in the same manner as they would in sand, or any other substance which affords no nourishment to vegetables. Pieces of each sort of stone were then burnt to lime: and, after they had been exposed for some weeks to the air, that their causticity might be diminished, some seeds were sown in them. In the kind of lime which was found most beneficial to land, almost all the seeds came up, and continued to grow, as long as they were supplied with water; and the roots of the plants had many fibres, which had penetrated to the bottom.

of the cup in which they grew. Upon examining the composition of this sort of lime, it proved to consist entirely of calcareous earth. By its exposure to the air for about three months, it was found to have absorbed four-fifths of the fixed air required to saturate it. In the other kind, a few only of the seeds grew, and the plants produced from them had hardly any stalks or roots, being formed almost entirely of the two seed-leaves, which lay quite loose upon the surface. This sort of lime, being spread upon a garden soil, to the thickness of about the tenth of an inch, prevented nearly all the seeds which had been sown from coming up, whilst no injury was occasioned by common lime used in the same manner. Upon examining the composition of this substance, which was so destructive to the plants, it was discovered to contain three parts of pure calcareous earth, and two of magnesia. The quantity of fixed air which it had absorbed, by being exposed for about the same time as the pure lime just mentioned, was only 42 hundredths of that combined with it before it was burnt.

As it seemed probable, that the magnesia contained in this lime was the cause of its

peculiar properties, the following experiments were made, to determine the effects of that substance upon the growth of vegetables. Some seeds, chiefly of cole-wort, which were preferred from their growing quickly, were sown in uncalcined magnesia; but though they sprouted, the leaves never rose above the surface, and the plants were entirely without roots; nor did they appear to grow better in magnesia which had been washed in water containing fixed air. Calcined magnesia was, however, much more destructive, as the seeds would not come up in it. To compare its effects on vegetables with those of lime, each of these earths was mixed, in different proportions, with sand, in small cups, in which seeds were then sown. The lime was obtained from marble; and, before it was put into the sand, was made to fall to powder, by being moistened with water. In a mixture of four ounces of sand with three or four grains of calcined magnesia, it was a long time before the seeds came up, and the plants had hardly any roots or stalks; and with ten grains or more of magnesia, there was no appearance of vegetation. Thirty or forty grains of lime did not retard the growth of the seeds more than three or four of mag-

nesia, and the injurious effects were not so lasting. The lime, by absorbing fixed air, soon lost its destructive properties; so that, after keeping these mixtures four or five weeks, seeds were found to grow in that with forty grains of lime, nearly as well as in pure sand; but, in that with four grains of magnesia, they produced only the seed-leaves, as was described before. It was necessary occasionally to break in pieces the sand which had so much lime, as it would otherwise have been too hard to admit the seeds to penetrate through it. Plants will bear a much larger proportion of magnesia in vegetable soil than in sand: with twenty grains, however, of calcined magnesia, in as much soil as was equal in bulk to four ounces of sand, the seeds produced only the seed-leaves, without roots; and, with about forty grains, they were entirely prevented from coming up.

In countries where the magnesian lime is employed, it was said, that the barrenness of any spot on which a heap of it had been laid, would continue for many years. To learn how far it could by time be deprived of its injurious qualities, I procured some pieces of mortar made of this species of lime, from two

houses, one of which had been built three, and the other eight years: they were taken from the outside of the building, where they had been exposed to the air. After they were reduced to powder, seeds were sown in them. Only a few came up, and even those produced merely the seed-leaves, without any roots. As plants would grow in the limestone from which this species of lime was formed, although not in the mortar made from it, I wished to know what proportion of the fixed air originally contained in the limestone, had been absorbed by the mortar. For this purpose, a piece of it was finely powdered, to render it of an uniform quality: it was then tried how much of this powder and of the limestone would saturate the same quantity of acid: by this means, I ascertained the proportions of limestone and mortar containing equal quantities of the magnesian lime. The fixed air being obtained from them in those proportions, and measured in an inverted vessel, with quicksilver, it was found, that the mortar which had been exposed three years had absorbed 43, and that of eight years, only 47 hundredths of the quantity originally contained in the limestone. I was not able to obtain any mortar which had been made

earlier, though it might deserve to be known how much fixed air it was ultimately capable of absorbing. Common mortar, which had been exposed to the air for a year and three quarters, had regained 63 hundredths of its full quantity of fixed air.

As the preceeding experiments were tried during the winter, in a room warmed by fire, perhaps under circumstances more favourable to vegetation, the same quantity of magnesia would not be equally pernicious.

Magnesian limestone may be easily distinguished from that which is purely calcareous, by the slowness of its solution in acids, which is so considerable, that even the softest kind of the former is much longer in dissolving than marble. From this property of the magnesian limestone, there appeared to be reason for suspecting that the kind of marble which had been called Dolomite, from M. Dolomieu, who first remarked its peculiarity in dissolving slowly, might also be similar in its composition. An analysis of this substance was lately given in the *Journal de Physique*, but this is probably erroneous; for, upon examining three specimens, they were found to consist of mag-

nesia and calcareous earth, like the magnesian limestone ; so that it ought, no doubt, to be considered as the same species of stone, but in a state of greater purity. The pieces of Dolomite were from different places ; one of them being found among the ruins of Rome, where it is thought to have come from Greece, as many statues of Grecian workmanship are made of it, and no quarries of a similar kind are known in Italy ; the second was said to have been thrown up by Mount Vesuvius ; and the third was from Iona, one of the western islands of Scotland. In many kinds of common marble, small particles and veins may be observed, which are a long time in dissolving. These, upon examination, I discovered to contain a considerable proportion of magnesia ; but, as they were probably not quite free from the surrounding marble, I did not ascertain the quantity precisely.

The crystallized structure which may generally be observed in the magnesian limestone, seems to show that it has not been formed by the accidental union of the two earths, but must have resulted from their chemical combination. The difficulty of dissolving it, may also arise from the attraction of the different

component parts to each other. The mortar formed from this kind of lime, is as soluble in acids as common marble ; and the substances of which it consists are easily separated. The magnesia may be taken from it by boiling it in muriated lime, and lime is precipitated by it from lime-water ; but neither of these effects can be produced by the stone, before it is calcined.

Magnesian limestone is probably very abundant in various parts of England. It appears to extend for thirty or forty miles, from a little south-west of Worksop, in Nottinghamshire, to near Ferrybridge, in Yorkshire. About five or six miles further north, there is a quarry of it, near Sherburn ; but whether this is a continuation from the stratum near Ferrybridge, I have not learnt. From some specimens which were sent me, I find that the cathedral and walls of York are made of it. I have not been able to learn whether there were any shells in the limestone of the tract of country before mentioned. In Mr. Marshall's account of the Agriculture of the midland counties, he speaks of the lime made at Breedon, near Derby, as destructive to vegetables, when used in large quantities. I

therefore procured some pieces of it, and they were discovered to contain nearly the same proportion of magnesia as that before described. In this quarry, the stone is frequently crystallized in a rhomboidal form ; and petrified shells, not calcareous, but similar in composition to the stone itself, are sometimes, but very rarely, found in it. This substance seems to be common in Northumberland. In the third volume of the Annals of Agriculture, Dr. Fenwick, of Newcastle, observes, that the farmers of that country divide limes into hot and mild. The former of these is no doubt magnesian, as it has similar effects on the soil ; and he remarks, that it is not so easily dissolved in acids as the latter. At Matlock, in Derbyshire, the two kinds are contiguous to each other ; the rocks on the side of the river where the houses are built being magnesian, and on the other, calcareous. The magnesian rock appears also to be incumbent upon a calcareous stratum ; for, in descending a cave formed in this rock, a distinct vein of common limestone may be observed, which contains no magnesia. The latter stratum is very full of shells ; but, though there are some also in the magnesian rock, yet they are very rare. In the following tables, containing the analysis

of various specimens, some other places are mentioned where this substance is found, but of which I received no further information.

After it was known that the magnesian marble and limestone consisted of the two earths, their proportion was attempted to be discovered, by trying how much gypsum and Epsom salt could be obtained, by means of vitriolic acid, from a certain weight of each specimen. When the superfluous vitriolic acid had been evaporated by heat, the Epsom salt was separated from the gypsum by water. The result of these trials is expressed in the following table.

		Dry gypsum.	Dry Epsom salt.
5 grains of limestone from Breedon	gave . . . . .	3.9	3.15
Matlock	. . .	3.95	2.9
Worksop	. . .	3.8	3.0
York	. . .	3.8	3.1
3 grains of calcareous spars, and 1 grain of calcined magnesia, gave	. . . . .	3.9	2.7

As the preceding method of estimating the quantities of magnesia and calcareous earth is liable to considerable error, I afterwards examined them in the following manner, which seems capable of great exactness. Twenty-

five grains of each substance were dissolved by marine acid, in a cup of platina, and, after the solution was evaporated to dryness, it was made red hot for a few minutes. The mass remaining in the cup, which consisted of muriated lime, and of the magnesia freed from the acid, was washed out with water, and poured into a phial. There was then added to it a known quantity of diluted marine acid, somewhat more than was sufficient to redissolve the magnesia, and, after the solution, a certain weight of calcareous spar, part of which would be dissolved by the superfluous acid. By the quantity of spar remaining undissolved, it was learnt how much acid was required to dissolve the magnesia. The iron and argillaceous earth contained in some specimens, were precipitated by the spar, and therefore could not occasion any error. The calcareous spar, however, dissolved more slowly where there was argillaceous earth, as it became coated with it; but this incrustation was occasionally removed, and, in all the experiments, the spar was left in the solution till it suffered no further diminution. For this purpose, it was necessary to keep them slightly warm for some days, during which

time, the phials were generally closed, to prevent any escape of the acid.

The first experiment in the following table was made upon known quantities of magnesia and calcareous earth, to try the accuracy of the process. For this purpose, also, the second was repeated upon a piece of limestone, previously powdered, to render every part of it of the same quality. The first column shows the quantity of calcareous spar which might have been dissolved by the acid required to take up the magnesia. The second shows the corresponding quantities of magnesia in 25 grains of each substance. The third expresses the quantity of lime. This was inferred by subtracting the weight of the magnesia, and of the iron and clay, from 13.2 grains, the weight of the whole quantity of earth in 25 grains of limestone. This is probably not very incorrect, as, in two specimens which differed most in the proportion of magnesia and lime, the weight of the two earths was nearly the same.

A piece of Dolomite, from Rome, was wrapped in a thin leaf of platina, that no part

of it might be lost, and, being then exposed to a strong heat, left of earth . 52.9 percent.

Dolomite from Mount Vesuvius 52.8

Breedon limestone . . . . 52.4

Calcareous spar left of lime . 55.8

In three of the experiments, also, the calcareous earth was precipitated by mineral alkali; and the quantity of it being tried by that of the marine acid required to dissolve it, it corresponded very nearly with that put down.

A quantity of marine acid which would dissolve 15 grains of calcareous spar, would also dissolve 5.5 of calcined magnesia, and 2.5 grains of spar; so that, 12.5 grains of spar required the same quantity of acid as 5.5 grains of magnesia.

The magnesia used was very pure, and made red hot immediately before it was weighed.

Substances examined.	Quantity of spar which the acid, required to take up the magnesia, would have dissolved.	Quantity of magnesia.	Quantity of lime.	Iron and clay.
Mixture of 5.5 grains of magnesia and 14 grains of calcareous spar, . . . . .	12.5	5.5	7.8	0
25 grains of Breedon limestone, previously powdered, . . . . .	11.53	5.071	7.929	.2
25 grains from part of the same powder, . . . . .	11.56	5.082	7.913	.2
25 grains of Dolomite, from Rome, . . . . .	12.2	5.37	7.73	.1
— Dolomite, from Iona, . . . . .	10.1	4.4	7.8	1.0 { Insoluble substance.
— Vesuvian Dolomite, . . . . .	10.38	4.565	8.575	.06
A second experiment, from part of the same Vesuvian Dolomite, . . . . .	10.03	4.411	6.848	.06
25 grains of magnesian limestone, from Wansworth, near Doncaster, . . . . .	12.75	5.61	7.34	.25
— Thorpe-Arch, . . . . .	10.95	4.84	7.8	.6
— Matlock, . . . . .	12.5	5.5	7.388	.31
— York Minster, . . . . .	11.	4.84	8.26	1
— Worksop, . . . . .	11.6	5.104	7.496	6
— Sherburn, . . . . .	11.5	5.08	7.56	.56
— Westminster-hall, . . . . .	10.1	4.44	8.37	.4

## ESSAY XX.

*On the new Leicestershire Sheep.*

THE following is a description of the superior class of individuals of this breed; especially ewes and wethers; in full condition, but not immoderately fat.

The *head* long, small, and hornless, with ears somewhat long, and standing backward, and with the nose shooting forward.

The *neck* thin, and clean toward the head; but taking a conical form; standing low, and enlarging every way at the base; the *fore-end*, altogether, short.

The *bosom* broad, with the *shoulders*, *ribs*, and *chine*, extraordinarily full.

The *loin* broad, and the *back* level.

The *haunches* comparatively full toward the

hips, but light downward: being altogether small, in proportion to the fore parts.

The *legs*, at present, of a moderate length; with the bone extremely fine.

The *bone*, throughout, remarkably light.

The *carcase*, when fully fat, takes a remarkable form, much wider than it is deep; and almost as broad as it is long. Full on the shoulder, widest on the ribs, narrowing with a regular curve towards the tail; approaching the form of the turtle, *nearer* than any other animal.

The *pelt* thin; and the *tail* small.

The *wool*, shorter than long wools in general; but much longer than the middle wools; the ordinary length of staple, five to seven inches: varying much in fineness and weight.

*Utility of form.*—The most distinguishing characteristics of this breed;—that which might be considered as its specific character, is the fulness, and comparative weight of its fore quarters.

This, however, seems to be contrary to the general principle of improvement, and affords matter of argument to the advocates of the old stock; who contend, that this form throws the meat upon the least valuable parts; legs and saddles, not shoulders and breasts, being the favourite joints.

The advocates for the new breed *argue*, in return, that the majority of the eaters of mutton are of the poorer class, and that the grand object of the improvement is their supply; *arguing* farther, that upon a given set of bones, and with a given quantity of other offal, a greater weight of meat may be laid on the fore-quarters, than on the hind ones.

*Offal.*—Another distinguishing character of the modern breed, is the smallness of their *bone*, comparatively with that of the old stock, and most other breeds; not of the legs only, but of the ribs and other parts. I have seen a rib of a sheep of this breed contrasted with one of a Norfolk sheep; the disparity was striking; the latter nearly twice the size; while the meat which covered the former was three times the thickness; consequently

*the proportion of meat to bone* was, in the one, incomparably greater than in the other.

The quality of the flesh of cattle is best ascertained when the animal is in a state of fleshiness,—full of condition, but not fat. In this state, if the flesh be bad, it handles *hard*, with a degree of *harshness*; if good, it is *soft* and *mellow*, with a degree of “*looseness*,” or rather *suppleness*, or *flexibility*; which, as the animal acquires a state of fatness, gives place to a degree of *firmness*—*fastness*;—a quality so nearly allied to hardness, that, without attending to the general state and condition of the animal, they might, by the inexperienced at least, be mistaken for each other.

But the flesh of sheep is to be judged by somewhat different criterions. These criterions, however, are not yet *fixed*. Professional men—breeders even of the first class—differ in their ideas of the subject: a proof that it has not yet been sufficiently studied.

It is nevertheless, allowed, by all superior breeders, that *looseness* is a *bad* quality of the flesh of *sheep*, when living; as being the criterion of coarse-grained, spungy mutton.

But the criterions of *good flesh* are not yet settled.

One superior breeder is of opinion, that if the flesh is not loose, it is of course good; holding, that the flesh of sheep is never found in a state of hardness, like that of ill-fleshed cattle:—while others make a fourfold distinction of the flesh of sheep; as *looseness*, *mellowness*, *firmness*, *hardness*; considering the first and the last equally exceptionable, and the second and third equally desirable; a happy mixture of the two being deemed the point of perfection.

The *degree of fatness* to which the individuals of this breed are capable of being raised, will, I am afraid, appear incredible, to those who have not had an opportunity of being convinced by their own observation. I have seen wethers, of only two shear (two or three years old) so loaded with fat, as to be scarcely able to make a run; and whose fat lay so much without the bone, it seemed ready to be shook from the ribs, on the smallest agitation.

It is common for the sheep of this breed to have such a projection of fat upon the ribs,

immediately behind the shoulder, that it may be easily gathered up in the hand, as the flank of a fat bullock. Hence it has gained, in technical language, the name of the foreflank; *a point* which a modern breeder never fails to touch, in judging of the quality of this breed of sheep.

What is, perhaps, still more extraordinary, it is not rare for the rams, at least, of this breed to be “cracked on the back;” that is, to be cloven along the top of the chine, in the manner fat sheep generally are upon the rump. This mark is considered as an evidence of the best blood.

Extraordinary, however, as are these appearances, while the animals are living, the facts are still more striking after they are slaughtered. At Lichfield, in February, 1785, I saw a fore-quarter of mutton, fattened by Mr. Princep, of Croxall, and which measured upon the ribs *four inches of fat!*

Since then, several sheep of this breed have laid six inches of meat on their ribs.

It is observable, that in sheep of this ex-

treme degree of fatness, the muscular parts decrease in thickness, as the fatness increases, and are so intermingled with fat as to give the whole a fatty appearance ; and this most especially in aged sheep ; which, as aged cattle, have more fat in proportion to lean, than younger carcases. A loin of mutton of a sheep (ten shear) of twenty-six pounds a quarter, weighed, when the fat was taken off, only two pounds and a half !

These are certainly interesting facts. But reflection aptly suggests the question, to what stomach can mutton like this be grateful ?

The answer held out is “ fat mutton is the poor man’s mutton : it goes further than lean, and has, of course, a smaller proportion of bone than lean mutton. A poor man gives eight-pence a pound for bacon, but only five-pence for fat mutton.”

This semblance, between fat mutton and bacon, is not altogether imaginary. When salted, and kept some time in pickle, even the palate perceives a strong resemblance. The advocates for growing bacon on sheep’s bones, instead of producing it, as heretofore, upon

those of swine, will say, that the art of preparing it has already been carried so far, as to deceive the palates, even of connoisseurs in eating.

It is also observable, in this place, that the breed of sheep under consideration, though they lay so great a quantity of fat *upon* the bones, seldom, in the butcher's phrase, “*die well*.” While the Norfolk sheep, for instance, as seldom “deceive the butcher.”

The Leicester sheep, however, appear to me to possess a quality, which more than counterbalances that deficiency. They weigh above their appearance. They have, likewise less offal (head, feet, and pelt,) and, when fully fat, *proportionably* less “inside,” than sheep in general. When highly finished, they appear as a solid lump of flesh. Though small to the eye, they will weigh thirty, or perhaps, forty pounds a quarter. Their flesh is, in reality, firmer than that of sheep which collect or lay up their fat within, while their muscles and their adipose membranes are left porous and spongy.

On the whole, we may venture to say, that,

in respect to carcase, the New Leicestershire sheep have a decided preference to most, if not all other breeds; and that the principle of improvement is, *thus far*, well founded.

This breed of sheep, when *seen* and *examined*, is *not greatly* deficient in wool. The wethers generally run about four to the tod (of 28lb.) the ewes about four and a half; the fleeces of the former weighing six to eight, of the latter five to seven pounds each.

Indeed, their cooler advocates *argue*, and with some show of *reason* on their side, that they not only produce more mutton, but more wool, *by the acre*, than any other breed of sheep.

The rams of the modern breed are never *sold*; but are passed from breeder to breeder, *by the season*, only. For the purpose of promoting this intercourse, each principal breeder has his show of rams; commencing, by common consent, the 8th of June; and lasting until Michaelmas, or until the whole are let. During a few weeks after the shows commence, every ram-breeder may be said to keep open house.—Breeders and others,

from all parts of the kingdom, as well as the promoters of the breed who reside in the neighbourhood, attend these shows; going in parties from one to another; some to take; others to see and pass their judgments.

These private exhibitions close with a public show at Leicester, the 10th of October; when rams of every description, but mostly an inferior sort of the improved breed, are collected, being brought in waggons; many of them a considerable distance; some to be *sold*; but chiefly to be *let*.

The principal ram-breeders save, annually, twenty, thirty, or perhaps forty ram lambs, castration being seldom applied, in the first instance, to the produce of a valuable ram.

For, in the choice of these lambs, they are led more by blood, or parentage, than by form; on which, at an early age, little dependance can be placed. Their treatment, from the time they are weaned, in July or August, until the time of shearing, the first week in June, consists in giving them every indulgence of keep: in order to push them forward for the show: it being the common practice to let,

such as are fit to be let, the first season ; while they are yet yearlings—provincially “ sharnhogs.”

Their first pasture, after weaning, is pretty generally, I believe, clover that has been mown early, and has got a second time into head ; the heads of clover being considered as a most forcing food for sheep. After this goes off, turnips, cabbages, colewort, with hay, and, report says, with corn. But the use of *this* the breeders *severally* deny ; though *collectively* they may be liable to the charge.

Such shearlings as will not make up sufficiently as to form and fatness, are either kept on to another year, to give them a fair chance, or are castrated, or butchered, while sharnhogs.

The shows of the principal breeders consist, by common consent, of forty rams each ; mostly from one to five shear ; they being seldom found efficient after that age ; some, however, will continue in vigour to the sixth or seventh year.

But even at these ages, the decay of vigour

is not *natural*; but it is brought on prematurely, by the unnatural state of fatness in which they are kept, and of which a variety of diseases, as well as a general unwieldiness of frame, are inevitable consequences.

Female sheep are found to be prolific to a greater age

It is observable, however, that the females, as well as the males, of the breed under notice, enter the stage of decay sooner than those of other breeds. This circumstance is accounted for, in their entering the stage of fatness sooner than other sheep; and there may be some truth in the idea.

The characteristic difference between what is termed a “ram-getter,” and a “wether-getter,” or a “good grazier’s sheep,” is that of the former being every where cleaner, finer: the head small, the bone and offal light, the flesh good, and the form beautiful. The mere grazier likes a ram no worse for having a strength of frame, and is less scrupulous about his form than the ram-breeder, whose great object is fineness; his ewes, and

the natural tendency of the breed, serve to give his offspring size and substance.

Some, however, set aside this distinction ; and, if there be no possibility of breeding grazing stock too fine, they are undisputedly right.

There is, however, one general guide, common to them both, and to which the judicious part of both pay some attention, namely, the imperfections of their ewes. In whatever quality or point they are most deficient, a ram possessing that particular quality or point, ought certainly to be chosen.

The breeders of rams, as well as of bulls, find it expedient to reduce them, from the cumbrous state in which they are shown, previous to the season of business ; the old rams, in particular, being frequently returned upon their hands non-efficient. Hence, as they are *let*, they are transferred to *private* pastures, and moderate keep ; it being a pretty general rule not to *show* a ram after he is *let*.

The usual *time* of beginning to send out, is the middle of September. The *means* of con-

veyance, carriages of two wheels, with springs, or hung in slings; some of them being large enough to hold four rams. In these they travel from twenty to thirty miles a day; being sent in this way, sometimes, two or three hundred miles.

Instead of turning the ram loose among the ewes, at large, as heretofore, and agreeably to the universal practice of the island, he is kept apart, in a separate paddock, or small inclosure, with a couple of ewes only, to make him rest quietly; having the ewes of the flock brought to him singly, and serving each no more than once.

By this judicious and accurate regulation, a ram is enabled to serve near twice the number of ewes he would do, if turned loose among them, especially a young ram.

In the old practice, sixty, or eighty ewes, were esteemed the full number for a ram: in the new, from a hundred to a hundred and twenty are allowed: seven score have been served by one ram, in a season.

In the choice of ewes, the breeder is led by

the same criterions, as in the choice of rams: *Breed* is the first object of consideration. Excellency, in any species or variety of live-stock, cannot be attained with any degree of *certainty*, let the male be ever so excellent, unless the female employed, likewise inherits a large proportion of the genuine blood; be the species or variety what it may.

*Next to breed, is flesh, fat, form, and wool.*

With ewes possessed of these qualities, in any tolerable degree, and with a ram of the same description, good wether-getters, at least, may be bred, with a degree of certainty: and with those, in a higher degree, accompanied with a superior degree of neatness, cleanness, fineness, and with a ram of this description, ram-getters may be reasonably expected.

After the lambs are weaned, the ewes are kept in common feeding pieces, at moderate keep: without any alteration of pasture, previous to their taking the ram. If, however, double lambs be desired, a flush of keep, at that time, might be eligible.

The *winter treatment* consists in keeping

them well, on grass, hay, turnips, and cabbages: no difference, I understand, being made in their keep, previous to the time of lambing.

The ewes of the modern breed, lamb with less difficulty, I understand, than those of most other breeds of long-woollen sheep; the heads of the modern breed being much finer. Their shoulders, I understand, are the most common cause of obstruction.

From the time of lambing, to the time of weaning the lambs, the ewes are treated with every indulgence of keep; not more on account of a general desire to push the lambs forward, than on that of the ewes of this breed being, generally, bad nurses;—deficient in milk.

As the modern breed of Midland cattle “run to beef”—its modern breed of sheep “run to mutton;” and from the same cause, a natural propensity of extraordinary strength, to a state of fatness.

The *time* of weaning is the latter end of July, or the beginning of August.

Previous to the separation, the lambs are, or ought to be, *identified* by ear marking, or otherwise; to guard against accidents, and the imperfections of the memory.

The female lambs, on being weaned, are put to good keep, but have not such high indulgence shown them as the males; the prevailing practice being to keep them from the ram; the first autumn:

At weaning time, or previously to the admission of the ram, the ewes are culled, to make room for the “thaves,” or shearlings, whose superior blood and fashion entitle them to a place in the breeding flock.

In the work of culling, the ram-breeder and the mere grazier go by somewhat different guides. The grazier's guide is principally *age*; seldom giving his ewes the ram after they are four shear. The ram-breeder, on the contrary, goes chiefly by *merit*; a ewe that has brought him a good ram or two, is continued in the flock, so long as she will breed: there are instances of ewes having been prolific to the tenth or twelfth year; but, in general,

the ewes of this breed go off at six or seven shear.

In the practice of some of the principal ram-breeders, the “culling ewes” are never suffered to go out of their hands, until after they are slaughtered: the breeders not only fattening them, but having them butchered on their premises. There are others, however, who sell them, and, sometimes, at extraordinary prices.

## ESSAY XXI.

*On Agricultural Political Arithmetic.*

THE kingdom of England, (excluding Wales,) contains, by the last edition of Kitchen's maps, published by Sayer, 41,536 square geographical miles, including its whole territory, inclosed and waste, roads, lakes, and rivers, but in this admeasurement the salt-water creeks, and the mouths of the great rivers are not included.

A geographical mile being, from Norwood's admeasurement, equal to one English mile and 268 yards; a square geographical mile contains 850 English statute acres very nearly, from whence the gross acres of the kingdom are 35,305,600.

In order to ascertain the loss by roads, I will conceive the whole thrown into a square, and subdivided by roads into square miles, each road 11 yards wide, this will give the

amount of roads or highways equal to 381,750 acres, very nearly.

Having no better data to proceed upon respecting lakes and rivers, I will suppose they occupy an equal space with highways, and that the waste lands, including woods and impracticable land, amount to 8,000,000 of acres; and allowing another 1,000,000 of acres for the cities, towns, villages, buildings, and yards, this leaves the cultivated land equal to 25,542,100 acres.

In order to estimate the number of people this quantity of cultivated land will employ, and the number it will maintain, let us conceive the whole thrown into farms of 240 acres each; my reason for fixing on this precise number of acres, is, having a farm in my eye of this compass, and which I conceive contains average land, little better or worse than the average of the kingdom, the produce of which farm I have been well acquainted with for many years.

Average a number of people supported by employment on such a farm:

The farmer, his wife, and four children, . . . . .	6
Three men servants, and three maid servants, . . . . .	6
Three labourers, their wives, and four children each, . . . . .	18
	—
Average number,	30
	—

Besides wheelwright, blacksmith, shop-keeper, tailor, collar-maker, miller, maltster, butcher, shoe-maker, and every other profession, liberal or mechanical, connected or depending.

To estimate the number of people the produce of such farm would furnish with food, let us suppose it thrown in courses as follows:

	Acres,
1st, Turnips ; 2d, barley ; 3d, clover ;	
4th, wheat; 20 acres each, . . . . .	80
1st, Oats ; 2d, winter tares ; 3d, wheat ;	
4th, barley ; 5th and 6th, grasses ;	
10 acres each, . . . . .	60
Meadow and pasture, . . . . .	100
	—
Total account, . . . . .	240
	—

I am far from supposing the before-named a proper course of cultivation for the average of the kingdom ; I know that so large a proportion as one-twelfth of the land of England, cannot, with propriety, be under turnips, but if it be managed in any other way equally productive (as it easily may), it brings the same conclusion.

*Average Produce of such Farm.*

The wheat of 30 acres, at 20 bushels per acre increase, i. e. 20 bushels per acre more than the seed sown,  $9\frac{1}{2}$  gallons the bushel ; and allowing upon the average of men, women, and children, 5 such bushels per head, per annum, this will furnish bread for 120 persons.

Nine gallons and a half of wheat, the measure of this country, will generally weigh 72lb. and will give  $\frac{4}{7}$  stone of flour, (14lb. to the stone), and sometimes a little more, and by the above estimate should be sufficient for 10 persons, men, women and children, for one week ; and supposing London to contain a million of people, this exactly agrees with the account laid by the cornfactors of London before the Minister on the late application

from France, that 20,000 sacks of flour was one week's consumption of the metropolis ; for the London sack of flour is, I believe, 20 stone of 14lb. and should, as above, be sufficient for 50 persons for one week ; and if one sack suffice 50 people, then will 20,000 sacks suffice **one million of people.**

Twenty-four dairy cows, which is one cow to ten acres, at  $2\frac{1}{2}$  cwt. per cow per annum, amounts to three tons of cheese ; which, divided amongst 120 persons, would be half a hundred weight per annum each person, great and small ; but this is much more than they would consume ; and supposing the object sometimes butter instead of cheese, there is no doubt but 24 cows would supply the above number of persons with cheese, butter, cream, milk, and every thing else of the kind.

The pork and bacon consumed by the 50 persons supported by employment on such farm, has been about 60 score weight per annum, and the weight fatted has sometimes very much exceeded four times that quantity, though it may be reasonably supposed, that much more salted meat is consumed in the country than in towns by the same number

of people, the inhabitants of towns having much readier access to the butchers for fresh meat; the resource for fattening hogs on farm product, is chiefly here boiled potatoes, and ground tail-end, or damaged barley, beat together.

Butcher's meat, I think one pound weight per head per week, taking in children, is a plentiful allowance; this, for 120 persons, would be 6240lb. weight per annum: let us examine whether a farm of the above size will furnish it,

1st, Veal, I will suppose 8 calves annually reared, and that allowing for losses, they will produce 6 in-calf heifers in addition to the 24 dairy cows; this gives a possibility of 30 calves, suppose after rearing and losses one-half only fattened, this gives 15 fat calves, suppose 20lb. per quarter each, this gives weight of veal . . . . .	lb. 1200
2d, Beef, 6 cows to go off annually to make way for heifers, suppose 3 only fattened to 150lb. per quarter each, weight of beef . . . . .	1800
Carried forward, . . . . .	3000

Brought forward,	lb.3000
3d, Mutton, a standing flock of 60 ewes, or as many as will give upon the average 60 lambs, 20 lambs to the butcher, 8lb. the quarter each, ,	640
20 ewe lambs kept store, and 20 ewes to the butcher, at 15lb. the quarter each, . . . . .	1200
20 wether lambs kept store, and 20 wethers to the butcher, at 18lb. the the quarter, . . . . .	1440
Total weight,	lb.6280

The standing stock to be as much above 60, as will make losses good.

Malt, I calculate the consumption at four bushels per head, taking in women and children, this for 120 persons is 480 bushels per annum; but the annual produce of such farm will be from 600 to 1000 bushels, a considerable surplus therefore remains for seed, for fattening cattle, for making good any other deficiencies, and for distilleries.

To prove whether the bill of fare, as here drawn up, be a reasonable allowance, let us

examine what revenue will be sufficient to maintain a family agreeably thereto; consisting of a man, his wife, and four children:

Bread-corn for six, at 5 bushels each per annum, 30 bushels, at $9\frac{1}{2}$ gallons each, at 6s.	£9 0 0
Cheese, butter, milk, &c. for six, the produce of a cow to five, at 5l. add $\frac{1}{2}$ ,	6 0 0
12 score of pork and bacon, at 4d.	4 0 0
6lb. per week of butcher's meat, for 52 weeks, 312lb. at 4d.	5 4 0
Malt, 24 bushels, at 5s.	6 0 0
	£30 4 0

To this, when luxuries and miscellaneous articles are added, I fancy it will be found a very plentiful allowance; such a one as the lower classes of society in general must never expect to obtain; it is intended as the average allowance, taking in rich and poor.

The game, fish, poultry, &c. of a farm, and of the whole kingdom, are thrown in as luxuries, and to make good deficiencies; the idea, therefore, set out with, and which this

detail attempts to establish, is, that a farm of 240 acres of the average land of England, will maintain 30 persons, by immediate employment; and, perhaps 30 more, by property, or employment, connected or depending; and furnish food for 60 more; making, in the whole, 120 persons, or one inhabitant to every two acres.

The enclosed land of England being as above 25,542,100 acres, will consequently employ 6,385,525 persons in agriculture and its connections, and furnish food for 6,385,525 more, to be employed in trade, manufactures, and commerce, and its connections, including the navy and army, as well as women and children, making in the whole 12,771,050 persons, and that in the present state of its best agriculture; and supposing 5*l.* per acre employed as capital in stocking such land, then the farming capital of the kingdom would be 127,710,500 sterling.

Let us suppose three-fourths only of the waste lands to be reclaimable, this brings an addition of 6,000,000 of acres, and leaves 2,000,000 for woods and impracticable spots, this addition finds employment for a million

and a half more people in agriculture and its connections, and furnishes food for a million and a half more, and consequently when the wastes shall be reclaimed, and brought to the state of our present improved land, the kingdom is capable of supporting an addition of 3,000,000 of inhabitants.

May be maintained from the present inclosed lands, . . . . .	12771050
Ditto from the wastes, when improved, . . . . .	3000000
Total the whole the kingdom could support in the present state of its best agriculture . . . . .	15771050

But it is very probable, that if a double capital were employed, and a proportionable addition of hands in a more operose culture, and in making every possible improvement that the land would admit, that then a greater quantity of provision than the above estimated might be raised, even in the proportion at least of two to three; many improvements might be made in spots apparently the most improved; some, which I conceive of the greatest national importance, (after the inclosure and improvement of wastes,) are here enumerated.

1st, The embankment of rivers, to prevent the destruction of hay: this might probably be effected to a great extent, by solid banks of earth parallel to the river on either side, at a proper distance, with a sufficient number of sluices to let through the water for irrigation at pleasure, the land between such embankment and the river would be of the same value as at present; the land without might have every benefit of irrigation, without risk from floods.

2d, Embankments from the sea; some accounts of great works of this kind I have read with great pleasure.

3d, The draining of bogs, morasses, marsh land, and every species of springy land by open or hollow drains; much remains to be done in this way.

4th, Irrigation, wherever water can be drawn without injury to mills and other public works.

5th, The marling and claying of all land that can be improved by it, the sanding of clay land, lime, chalk, mud, &c. wherever it will make improvement.

6th, Raising the greatest quantity of manure and compost possible, by scouring ditches, cleansing ponds, and perhaps bringing green vegetables to rot, and mixing couch grass and other root weeds with lime in addition to the common methods in use.

7th, Improving the herbage of meadow and pasture land, by breaking up and cleaning weedy rubbishy turf, and laying down clean with the best grasses.

8th, Enlarging the extent of useful land by plashing hedges, stocking baulks, filling up old useless pits, planting impracticable land with timber, and bringing such quantity of flat wood land as can be spared into arable, meadow, and pasture, as the timber becomes ripe.

9th, The universal introduction of beans, pease, or other productive fallow crops, kept perfectly clean, instead of barren fallow.

10th, The growth of potatoes and cabbages, as well turnips, carrots and other roots, in as great quantities as they can be consumed by man and beast.

11th, The improvement of the breed of horses, that fewer may be able to do the work; the improvement of carriages, ploughs, and other implements, that less strength may be wanted.

12th, The extending and improving our fisheries, by every possible means.

When by these and other improvements, the Agriculture of the kingdom is brought to its true maximum, I do not hesitate to pronounce it my firm opinion, that the 40 counties of England will be able to raise sustenance for 22 millions and a half of people.

And supposing Scotland, Ireland, and Wales, taken conjointly, and an equal state of improvement, to be equal in product to England; then the three kingdoms, with the principality of Wales (in the highest state of improvement) are capable of supporting 45 millions of people.

In this Utopian state of the empire, less danger of famine might be apprehended, than even in its present situation, that calamity

more generally befalls a people in the early stages of society. The capitals employed in Agriculture would enable the farmer to keep in hand a year's stock of unthreshed grain, by which time every kind of grain attains its highest perfection, and in case of real deficiency of product in harvest, the stock in hand would prevent any serious immediate consequences; and the capitals and consequent connections of the merchant adventurer, would enable him to draw supplies from every part of the world, where procurable.

It might be a curious and useful disquisition, highly worthy the attention of the philosopher and patriot politician, to inquire into and explain the natural, physical, and political causes, which accelerate or retard a nation in its progress to its highest state of improvement; as the writer of this believes it to be a subject far above his opportunities of acquiring information, his leisure, and his abilities, he will only hint at what he conceives some of the most prominent and striking features, hoping the particular discussion will be taken up by some abler head, and abler hand.

It is self-evident, that a full population is necessary to the improvement and perfection of any nation; some of the causes which prevent this full population taking place, may be the prevalence of contagious diseases, as the plague; this the mercy of God has kept us free from for more than a century, and the disorder not being naturalized, it is very probable the common precautions are sufficient.

The small-pox, in which thousands of lives have been saved, by inoculation, and more will be, as superstition abates.

Fevers, and phthisis pulmonalis, carry off great numbers, prematurely, in England; but even here I have great hopes and expectations of mortalities being fewer; and my hopes are grounded on the improvements in the medical art; not more in the philosophical, anatomical, and chemical part, than in the general principle, whereby the physician employs his art, not as the mistress, but as the handmaid of Nature.

The curse of wars!—This, from the ambition of a few individuals, seconded in all ages

by the depravity of mankind, has been so great a scourge, that it may almost be called in question whether all the benefits derived from civil government have made amends for it;—the evil consists not only in the destruction of part of the manhood of a country, and the consequent solitary or profligate life of a proportionable number of the other sex, but also in diverting great capitals from the natural current—from the improvement of agriculture, and the extension of commerce:—the writer of this is of opinion, that robbery and murder are almost virtues, compared with the monstrous enormity of destroying the lives and properties of thousands, for the sake of gratifying the ambition and cruelty of a few individuals!

Foreign colonies, before the mother country is half peopled; this has been a great mistake in different ages.—The object of every country should be the improvement of her own territory, and the extension of her commerce; not the acquisition of foreign dominion, before the cultivation of her own be half perfected.

Whatever tends to discourage matrimony, or to oppress the honest and industrious

labourer and mechanic, must doubtless retard the improvement of a country.

Taxes laid on the materials used in building, as they have a tendency to discourage the building of houses, are, I think, very impolitic.

Whatever has a tendency to prevent dissipation, and mend the morals of a people, must increase both their numbers and their industry; perhaps lessening the number of petty ale-houses might have a good effect this way.

Public bounties to great exertions, both in agriculture and the mechanic arts; and perhaps also to the honest and industrious labourer and mechanic, who has more than a specified number of young children. Something very liberal has been done in this way by public bodies, very much to their honour; and they deserve the support and assistance of government.

An increase of general knowledge amongst mankind, has a decided tendency to every kind of national improvement.

## ESSAY XXII.

*On the Rabbits of Angora.*

THE rabbits of the Angora breed, yield in Normandy a wool which serves as a primary material in several considerable manufactures. The Normans assert that each rabbit yields wool, of the value of a crown of six livres. As this wool admits of being worked up with other wool, and different materials, it seemed to me to be an object worth inquiring into more particularly, whether some economical food might not be discovered for these animals, and which, at the same time, would serve for a great number of them.

For this purpose I made a sacrifice of the trees and plants in my garden, and permitted these rabbits, and others of the common sort, to range therein at liberty. I observed, that the first day they ran from tree to tree, and from plant to plant; but the second day, they rejected the food they had selected the first day; and on the third day they quitted the

vegetables they had fed upon the two first days. At the expiration of eight days, I distinctly perceived that they seemed to delight in the leaves of the *Robinia pseudo acacia* (the false acacia). I then confined them, in order to feed them entirely on those leaves: they not only continued to devour them ravenously, but also ate the bark on the branches of the tree. Satisfied with this discovery, I resolved to feed some females with these leaves solely, while to others I gave cabbage leaves, and the common food furnished to these animals. I observed that the young ones proceeding from the females, fed on the leaves of the *Robinia*, grew larger, and in less time, and that their coats and wool were finer than on the others fed in the common way. I caused the skins of the indigenous rabbits fed with the *Robinia* leaves to be examined by hatters, and they valued them much more than the common ones, asserting that their wool approached in quality to that of hares.

This discovery becomes interesting for several reasons, and nominally for the following ones:

1st, That the *Robinia* thrives in barren and

uncultivated districts, on heaths, of which I have a certain proof on an acre of land I purchased near Maestricht, where the *Robinia* thrives remarkably.

2d, Because when the branches of the *Robinia* are pruned, it grows better, becomes thicker, and resists the wind better.

3d, Because the branches and leaves of the *Robinia* are remarkably numerous.

4th, Because the leaves may be converted into hay, which rabbits and other animals devour most eagerly.

5th, Because the growth of the *Robinia* is of longer duration than the major part of other trees.

6th, Because one person is able to cut a sufficient quantity of branches thereof for a great number of rabbits, or hares.

7th, Because rabbits may be looked after by children.

8th, Because, on establishing a mode of rearing rabbits, a number of hands would be employed, and the primary materials of various manufactures would be augmented, as well as an increase of excellent manure.

9th, Because under the *Robinia* we may sow turnips, vetches, beans, and other vegetables proper to feed cattle.

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## ESSAY XXIII.

### *On the Universe.*

THE Universe may be considered as the palace in which the Deity resides; and this earth of ours as one of its apartments. In this, all the meaner races of animated nature mechanically obey him; and stand ready to execute his commands, without hesitation. Man alone is found refractory; he is the only being endued with a power of contradicting these

mandates. The Deity was pleased to exert superior power in creating him a superior being; a being endued with the choice of good and evil; and capable, in some measure, of co-operating with his own intentions. Man, therefore, may be considered as a limited creature, endued with powers imitative of those residing in the Deity. He is thrown into a world that stands in need of his help; and has been granted a power of producing harmony from partial confusion.

If, therefore, we consider the earth as allotted for our habitation, we shall find, that much has been given us to enjoy, and much to amend; that we have ample reasons for our gratitude, and still more for our industry. In those great outlines of Nature, to which art cannot reach, and where our greatest efforts must have been ineffectual, God himself has finished these with amazing grandeur and beauty. Our beneficent Father has considered these parts of Nature as peculiarly his own; as parts which no creature could have skill or strength to amend: and therefore, made them incapable of alteration, or of more perfect regularity. The heavens, and the firmament, show the wisdom, and the glory of the Work.

man. Astronomers, who are best skilled in the symmetry of systems, can find nothing they can alter for the better; God made these perfect, because no subordinate being could correct their defects.

When, therefore, we survey Nature on this side, nothing can be more splendid, more correct, or amazing. We there behold a Deity residing in the midst of an universe, infinitely extended every way, animating all, and cheering the vacuity with his presence! We behold an immense and shapeless mass of matter, formed into worlds by his power, and dispersed at intervals, to which even the imagination cannot travel! In this great theatre of his glory, a thousand suns, like our own, animate their respective systems, appearing and vanishing at divine command. We behold our own bright luminary, fixed in the centre of its system, wheeling its planets in times proportioned to their distances, and at once dispensing light, heat, and action. The earth also is seen with its twofold motion; producing, by the one, the change of seasons; and by the other, the grateful vicissitudes of day and night. With what silent magnificence is all this performed! with what seem-

ing ease ! The works of art are exerted with interrupted force ; and their noisy progress discovers the obstructions they receive ; but the earth, with a silent steady rotation, successively presents every part of its bosom to the sun ; at once imbibing nourishment and light from that parent of vegetation and fertility.

But not only provisions of heat and light are thus supplied, but its whole surface is covered with a transparent atmosphere, that turns with its motion, and guards it from external injury. The rays of the sun are thus broken into a genial warmth ; and, while the surface is assisted, a gentle heat is produced in the bowels of the earth, which contributes to cover it with verdure. Waters also are supplied in healthful abundance, to support life, and assist vegetation. Mountains arise, to diversify the prospect, and give a current to the stream. Seas extend from one continent to another, replenished with animals, that may be turned to human support : and also serving to enrich the earth with a sufficiency of vapour. Breezes fly along the surface of the fields, to promote health and vegetation. The coolness of the evening invites

to rest; and the freshness of the morning exhilarates for labour.

Such are the delights of the habitation that has been assigned to man; without any one of these, he must have been wretched; and none of these could his own industry have supplied. But while many of his wants are thus kindly furnished on the one hand, there are numberless inconveniences to excite his industry on the other. This habitation, though provided with all the conveniences of air, pasturage, and water, is but a desert place, without human cultivation. The lowest animal finds more conveniences in the wilds of Nature, than he who boasts himself their lord. The whirlwind, the inundation, and all the asperities of the air, are peculiarly terrible to man, who knows their consequences, and, at a distance, dreads their approach. The earth itself, where human art has not pervaded, puts on a frightful gloomy appearance. The forests are dark and tangled; the meadows over-grown with rank weeds; and the brooks stray without a determined channel. Nature, that has been kind to every lower order of beings, has been quite neglectful with regard to him; to the savage uncon-

triving man the earth is an abode of desolation, where his shelter is insufficient, and his food precarious.

A world thus furnished with advantages on one side, and inconveniences on the other, is the proper abode of reason, and is the fittest to exercise the industry of a free and a thinking creature. These evils, which art can remedy, and prescience guard against, are a proper call for the exertion of his faculties ; and they tend still more to assimilate him to his Creator. God beholds, with pleasure, that being which he has made, converting the wretchedness of his natural situation into a threate of triumph ; bringing all the headlong tribes of Nature into subjection to his will ; and producing that order and uniformity upon earth, of which his own heavenly fabric is so bright an example.

## ESSAY XXIV.

*On the Preservation of the Health of Persons employed in Agriculture, and on the Cure of the Diseases incident to that way of Life.*

THE way of life of persons engaged in agricultural business, exempts them from many of the disorders to which other occupations are liable. Many of the employments by which great numbers of people are supported, are injurious to health, by being either too sedentary, or too laborious; by which the powers of Nature are either suffered to languish for want of exertion, or worn out prematurely by over-fatigue. But the business of husbandry is not necessarily connected with either of these extremes. The labour is indeed constant, but not in general so violent as either to exhaust the strength by over-straining, or to excite any weakening degree of discharge by perspiration. The variety likewise of the necessary business is a favourable circumstance for those who are employed in it, as thereby the different muscles of the body are exercised, and various postures

used, which contribute to strengthen the body more generally, and also relieve the mind by a diversity of attentions.

A farther advantage attending the nature of labour in husbandry is, that it is performed in the open air, which in general must be pure and wholesome, as being free from smoke and other vapours arising from inflamed bodies, and also from putrid exhalations both of the animal and vegetable kind, which are well known to taint the air in large cities, and in manufactories of every kind, where great numbers of people are assembled in a small compass.

The surface or staple of the soil, which is the subject of these operations, does not give out any noxious odours, like many of the mineral or metalline substances employed in several manufactories, but is at least perfectly innocent, and has even been thought to produce effluvia rather favourable than injurious to health. The number of vegetables, likewise, with which persons concerned in such employments are generally surrounded, contribute to render the air which is respired pure and salubrious, by absorbing the putrid and phlogistic substances that float in the atmosphere.

The diet of persons who live in the country is, I think, in general more wholesome than that of those who inhabit towns. A large portion of it consists of fresh vegetables and milk, which, though not excluded from the food of those who live in towns, are enjoyed in much greater plenty and higher perfection in rural situations. These correct the putrefactive disposition of animal food, and tend to keep up the proper secretions and evacuations, and to maintain that balance in the animal system, upon which health so much depends.

The regular hours necessary to be observed by those who follow country business, are perhaps of more consequence than any of the other articles, however important those may be.

It is an old and a common opinion, that the external air is much less salubrious during the night than the day; and this opinion, which probably was at first drawn from observation, seems to be confirmed by chemical experiments, which tend to show that the air exhaled by vegetables, whilst the sun is above the horizon, is much more pure and fit for respiration than

that which issues from them in the absence of the sun. The ill effects of the latter are probably best avoided, by the human body being in a state of repose and insensibility, which render it less liable to be affected by such impressions. The morning air, on the contrary, so celebrated both by poets and philosophers for its benign and cheering effects upon the mind and body, is enjoyed in high perfection by persons in this way of life: and the advantages they derive from thence in point of health are probably very great.

I have been informed from the best authority, that a person in high station some years ago, who was very desirous to protract his existence in this world as long as he was able, made every possible inquiry concerning the regimen and manner of life of those persons who had arrived at a great age, but found no circumstance common to them all, save that they all had observed great regularity in point of hours; both rising early, and going early to rest.

Freedom from care and anxiety of mind is a blessing, which I apprehend such people enjoy in higher perfection than most others,

and is of the utmost consequence. Mental agitations and eating cares are more injurious to health, and destructive of life, than is commonly imagined; and could their effects be collected, would make no inconsiderable figure in the bills of mortality.

The simplicity and uniformity of rural occupations, and their incessant practice, preclude many anxieties and agitations of hope and fear, to which employments of a more precarious and casual nature are subject. Nor is it the least advantage to health, accruing from such a way of life, that it exposes those who follow it to fewer temptations to vice than persons who live in crowded society. The accumulation of numbers always augments in some measure moral corruption, and the consequences to health of the various vices incident thereto, are well known.

The life of husbandmen and farmers, though in general healthy, has, like other situations, some circumstances attending it which produce disorders. These may be considered in several points of view, according to their causes.

First, then, the nature of their employment

often exposes such persons to the vicissitudes of weather. These, perhaps, may be of many very different kinds, when considered with regard to the changes in the nature of the atmosphere; but this is an inquiry too deep and obscure for a popular treatise, like the present, and I shall only take notice of such as are obvious and certain. These are three in number, *cold*, *heat*, and *moisture*; to which may be added, a combination of the last of these with either of the former.

Exposure to a great degree of cold may produce inflammatory disorders of different sorts, but principally, though not altogether, of the topical kind. Thus the inflammatory sore throat, rheumatic pains in the teeth and face, inflammations of the eyes, and coughs, with pain of the breast, attended with fever, are all complaints liable to be produced by cold air, either externally applied, or drawn in by the breath. To these may be added, the rheumatism, both of the acute and chronic kind, which, though sometimes a local disorder, is often general, and may be frequently traced to this cause.

Cold, likewise, when great, and long con-

tinued, is apt to produce disorders of an opposite nature to those just mentioned. Paralytic affections are frequently caused by it, especially in the lower extremities, which are generally the most exposed to its influence. ,

Heat is another source of disease to the husbandman, who often experiences its bad effects in time of harvest. Inflammatory fevers are often the consequence of heat and labour, and sometimes such as are attended with local inflammation, as pleurisies, peripneumonies, inflammations of the bowels, &c. Sometimes the brain is primarily affected, probably from the immediate effect of the sun's rays upon the head. The eyes are also liable to be inflamed from exposure to strong light. Moisture, especially when combined with either of the above extremes of temperature, is productive of several disorders.

People who work in the open air, and oftentimes at a distance from shelter, must necessarily be exposed to casual showers at every season of the year. If these happen in cold weather, they aggravate the bad effects of cold, by conveying it to a closer contact with the skin, and also by the generation of

cold by evaporation. If rain fall suddenly at a warm season of the year, its effects are, I apprehend, less dangerous than in cold weather to those who are wet with it; nevertheless it is not void of hazard, especially if the persons exposed to it have been previously much heated, either by the weather, or exercise.

The evaporation of the moisture generates a degree of cold, which is greater as the evaporation is quicker. This then is one reason, why the danger of wet clothes is greater, as the body is more heated.

Whether moisture, simply considered, has any other effect than as increasing the influence of cold, is not clearly determined. But whatever doubts we may entertain, concerning the moisture of the atmosphere, there is no question that some kinds of moisture, to which persons who labour in this way are sometimes exposed, has specifically noxious qualities.

The draining of marshy grounds, however it may in its consequences benefit the health of those who live in the neighbourhood, has been long observed to be but an unwhole-

some employment for those who work at it. Yet this is frequently a necessary piece of business for the farmer, as well as the cleansing of ditches, which is in some measure of the same kind, though in general less apt to do mischief. The moisture to which people thus employed are exposed, must not be considered as mere humidity; but as humidity, combined with putrefying substances, and capable of diffusing the effects of such over those who are within a certain distance of it.

Marsches are well known to produce disorders, even over a considerable extent of country, and must of course be particularly liable to affect those who break up any part of them. Putrid complaints of various kinds may be produced by these exhalations; but I apprehend, the intermittent fever is the usual consequence; the frequent appearance of which, in moist and fenny countries, has been universally observed.

Such are the diseases to which people employed in husbandry are occasionally liable from the nature of their occupation. But they are subject to a much greater number

from their own imprudence, of which I shall next speak.

And, first, *Of their wanton exposure of themselves to the vicissitudes of Heat and Cold.* It is no uncommon thing for people who work in harvest, when violently heated by the weather and by labour, to drink large draughts of some cold thin liquor, as water, milk, whey, butter-milk, and such like. This, if taken in great quantity, has been sometimes known to suppress the powers of life altogether, and to produce an almost instant death.

This however, I believe, seldom happens; but the bad effects of this practice appear in other ways sufficiently serious to discourage such hazardous experiments. It is not uncommon for a violent fever to be the consequence, which is frequently attended with inflammation of the stomach or bowels; both which are disorders of the most dangerous nature. But should they escape incurring any acute complaint, it is common for them to be effected with a sense of weight and sickness at the stomach, which continues several weeks, and is at last relieved by

vomiting; this, however, does not put a period to the complaint, as it is generally followed by an itching eruption on the skin in blotches, in various parts of the body, which proves to be the leprosy—a loathsome and filthy disease, and very difficult of cure!

I have had an opportunity of seeing at the Bath Hospital, a great number of people thus afflicted. and am satisfied that they all, without exception, owed their disease to the application of cold, in some form or other, to the body when in a heated state.

Labouring persons are very apt, when they leave off any work in which they have been much heated, to remain some time at rest in the open air before they put on their clothes. This is a very imprudent practice, and frequently produces bad effects, especially in bringing on coughs, and other disorders of the breast, which oftener owe their rise among the common people to this than any other cause.

Neglect of changing their clothes when wet, is also a great source of disorder among husbandmen. To remain in wet clothes when

the body is at rest, subjects the person who is so imprudent as to suffer it, to the united bad effects of cold and moisture. Much worse consequences may however be expected, when they who are heated by labour lie down to sleep, as they often do, in their wet clothes. The diminution of the force of the circulation and other powers of life, which always takes place during sleep, causes the bad effects of cold to operate with much greater danger to health and life. This hazard is much aggravated, if they add to this imprudence by sleeping on the wet ground. This not only communicates an additional moisture and cold, but is perhaps still more prejudicial from the nature of the exhalation. It is the opinion of a physician of the greatest eminence, that the vapour which arises from moist earth is the cause of the most dangerous fevers. Those, therefore, who put themselves wantonly in the way of such danger, are guilty of little less than suicide.

*Excess, or Irregularity in Diet,* is another source of disorder to people in this way of life. This is common indeed in some measure to all ranks, but in several respects it is particularly applicable to those who are employed

in husbandry. Air and exercise are well known to sharpen the appetite ; and as these advantages are incident to this way of life, it may be expected that some excess should now and then take place. The diet of such persons is indeed in general too spare and plain to offer any great incentive to indulgence in point of quantity, but opportunities sometimes offer for a more plentiful allowance of food, and more inviting to the palate. On such occasions the lower ranks of people exert little consideration or prudence. They have scarcely any view beyond the gratification of the present moment ; and if a full indulgence of appetite is not exercised, they deem it a loss of an opportunity for the enjoyment of so much happiness.

It is needless to enumerate in this place all the complaints that excess in quantity of food may bring on ; it is sufficient to say, that it has often produced sudden death, and where its violent effects have not been so immediate, has laid a foundation for bad health during the remainder of life.—To this head may be referred the brutal practice of eating enormous quantities for a wager, or out of bravado. It is needless to descant upon so odious a sub-

ject, farther than to say, that such things sink men below the level of beasts in grossness and folly, not to mention the scandalous immorality of such actions.

The diet of people employed in husbandry, does not admit of much luxury respecting its quality; there are, however, some things which come within the reach of these people, and which they regard as gratifications, and of course are apt to take in too great quantity. Of this kind are some of the autumnal fruits, which in some years are produced so largely, as to be of scarcely any pecuniary value. Of these, plums, especially such as are of the coarser and more austere sorts, are the principal. It is a common observation, that, in years wherein there is an abundance of such fruits, purgings, colicks, and most other complaints of the stomach and bowels, are very common. It is proper here to observe, that the incautious manner in which these fruits are devoured, especially at their first coming in, causes many of the stones to be swallowed, a practice extremely hazardous. The history of physic affords many examples of the worst consequences arising from such bodies lodging in the stomach and bowels. Sometimes,

when the accumulation of them has been considerable, they have obstructed the alimentary canal altogether, and produced a miserable death in a short time; at others, they have made their way through different parts of the body, and caused either a long and painful illness, or death, by the hectic fever attending internal suppurations.

*Pears*, if eaten too freely, are apt, as well as the stone-fruits, to disorder the stomach and bowels; but they are less dangerous, and not so often swallowed in such quantities as to be materially prejudicial to life or health.

*Nuts* are, perhaps, upon the whole, the most dangerous of any of the fruits that are likely to fall into the way of this rank of people. When eaten in large quantity, they have been often known to lodge in the stomach, and to be incapable of being removed from thence by any medicine, and of consequence have put a speedy end to life. When taken in less quantity, they are found to oppress the breathing, and to produce vomiting and bowel complaints.—HOFFMAN observes, that dysenteric complaints are always most common in those years in which the harvest of nuts is

plentiful. Excess in diet, however, is more frequently committed in liquids than in solids.

It is observed of mankind in general, that they have a natural fondness for fermented or spirituous liquors, and a certain proportion appears to be allowable, and even necessary, for persons who undergo hard labour. But the healthy quantity is apt to be exceeded when opportunity offers, and excess of this kind is more hurtful than a defect of such gratifications. I need not here enlarge on the consequence of *drunkenness* to health. Fevers, dropsies, consumptions, apoplexies, and many other miserable disorders, are well known to follow such a course. The want of money among labouring people, indeed, often prevents the bad effects of a habit of this kind, but occasional opportunities occur, which are laid hold on with great avidity; and it is far from uncommon to find death the immediate follower of such licentious indulgence.

Diet, however, is not the only article which such persons are liable to carry to excess. It is common to see exertions of a more liberal kind pursued to too great length. The caprice

of emulation will often produce instances of labour, which duty, and the urgency of circumstances, might in vain solicit. The bursting of some blood-vessels, particularly those of the head, lungs, or stomach, nephritic complaints, and intestinal ruptures, have all of them followed such ill-judged and ostentatious display of strength and corporeal abilities.

After the above enumeration of complaints to which persons thus employed are liable, it is proper I should offer something on the subject of their cure or relief. This I shall consider in two views; the first as to what regards the prevention of disorders, and the second as to what regards their cure.

Persons that work in husbandry are necessarily exposed to the weather in both its extremes of temperature. The ill effects, therefore, of both, it behoves us to counteract. Cold in this climate is most necessary to be attended to, as its operation is of longer duration; several months in the year often requiring us to be on our guard against cold, whilst excessive heat scarcely lasts more than a few days. Warmth of clothing is the only method,

exercise excepted, by which those who spend their life in the open air can guard against cold ; and nothing is more necessary for such persons as are the subjects of the present consideration, than a proper regard to this article.

The woollen cloths of our own country are perfectly well adapted for these purposes, being warm, without being too heavy, resisting moisture in a good measure, and even when wetted, being less cold to the touch than any other substance. It appears to me, that some of the coarser and looser woven fabrics are preferable, both in point of warmth and lightness, to those of a more even surface, and also give more resistance to the penetration of moisture.

Every person who employs men under him in business of this nature, ought to be careful, in point of interest, as well as humanity, that his servants have clothing sufficient for the season of the year ; otherwise he may expect a proportionable diminution in the labour he expects to be performed, and the loss of many valuable opportunities, especially in precarious weather and seasons.

The same arguments are applicable to those who have the care of the parish poor; whom it would be far more economical, as well as humane, to preserve in a good state of health, than to suffer them to become victims of diseases which might be prevented. This caution refers particularly to the youth, who, by being neglected at that time of life, often continue burdens on those persons whose expenses (had the children's health been duly attended to,) they might have contributed to diminish:

Friction, properly applied, might prove an excellent preservative against, and even a remedy for many of the bad effects of cold: Would persons chilled with the severity of the weather, rub their bare limbs with woollen cloths for a considerable time after they return home, it would produce a more equable and genial warmth, and contribute more to support the powers of life, than any artificial heat whatsoever. The same operation would probably prevent many of those painful and refractory sores called chilblains, which are so apt to affect the extremities, especially in young people. Should any persons in extreme frost have their limbs, or any part of the body

actually frozen, the utmost caution must be had not to bring them near to any fire. The safest method is said to be, to rub the part frozen first with snow, and to continue the friction till some degree of warmth begins to appear, but not to suffer the access of any heat from fire, till the warmth from friction takes place. Even then, the part frozen should not be suddenly exposed to the heat of a fire, but rather be continued to be rubbed till the natural sensation and heat are perfectly restored. If the part frozen be exposed to the heat of a fire, whilst in a frozen state, it will undoubtedly mortify.

It seldom happens, that the cold is so intense in this country, as to destroy those exposed to its influence by its direct and immediate operation; yet as great degrees of it now and then take place, it may be proper to caution those who may be in a situation that exposes them for any considerable time together to violent cold, to be cautious how they suffer any propensity to sleep, or drowsiness, to steal upon them. A tendency to sleep in a person who is in such a state, is a certain sign that the cold begins to gain ground on the powers of life, and should

therefore excite the strongest efforts to resist it. This may be a difficult task, but is necessary, as life entirely depends upon it.

*Heat*, though less frequently an object of our care in this respect than cold, nevertheless demands our attention. Though seldom of long duration, the heat is sometimes excessive. I have seen it in the shade, and in a situation exposed to no reflected heat, raise the thermometer to 87 degrees. Such heats, and even considerably less, are too great for laborious work even in the shade, and must be still more injurious to those who are exposed to the sun's rays, which is of necessity the case with those who work in the harvest.

In such extremities of temperature, it should not be expected, or even permitted, that the unthinking labourer, who has scarcely any views beyond the present moment, should expose himself to such hazard. Economy, as well as humanity, pleads loudly in behalf of such indulgence.

Inferior, yet still considerable degrees of heat, although they need not preclude work in the open air, still have need of some cautions

respecting them. It is not uncommon to observe a degree of impatient anxiety which accompanies some people in every action of life. This prevails among the lower as well as higher ranks of mankind, and often proves a source of fatigue and toil, without expediting labour. Calmness and composure are necessary to the corporeal as well as the mental operations, and tend greatly to prevent the bad effects of excess of stimulus of any kind.

As the head is the part principally exposed to the actions of the solar rays, it is particularly necessary to use some defence for that part. Hats are used for this purpose, but the black colour of which they are generally made, causes them to absorb the heat, and of consequence to accumulate it in the very part on which we should least desire it to fall. Hats for working people, in hot weather, should be made of straw, or some light substance of a white or pale colour, and with brims sufficiently wide to shelter both the head and shoulders from the scorching beams of the sun. Even a piece of white paper covering a hat, is no contemptible defence against solar heat.—The eyes should likewise be considered, which exposure to strong light is so apt to in-

jure. This should be guarded against by the brim of the hat being made of a sufficient breadth to shade the eyes, and the inside should also be tinged of either a green or blue colour, but by no means either black or a very light hue.

I have before mentioned the bad effects of cold applied in any way to the body when violently heated. This should serve as a sufficient caution against such imprudencies. It may be useful to add, that as it may be necessary to drink frequently, it prevents much of the bad effects of cold liquor, to eat something solid immediately before any liquid be taken. A few morsels may be sufficient, and the efficacy of the precaution is well known.

The mischievous consequences of cold liquors, drunk in such cases, are much aggravated when they are, as is too common, swilled down in enormous draughts. Would thirsty people but have a little patience, and drink small quantities at a time, with proper intervals, as of a few minutes, the uneasy sensation would be more effectually removed, and that without any danger to health.

Another caution highly necessary for such persons is, to put on their clothes immediately on their leaving off work, and to do this without any regard to the warmth of the weather. Nothing can be more hazardous than for a person who is heated with labour, and in a strong perspiration, to remain exposed to the wind. The exhalation both from the body and the wet linen, produces a sudden and considerable degree of cold, which is not merely transient, but continues as long as the moisture is suffered to exhale freely into the open air.

I have before remarked the hazard of labouring persons sleeping on the ground during the intervals of their work. This is improper at all times, but particularly dangerous if the ground be any wise moist. Indeed I am of opinion that sleep had better be avoided altogether at such times; as such slumbers produce but little refreshment, and expose the health to unnecessary risque. The body would be sufficiently rested by the cessation of labour, and early hours in the evening would afford a sufficient portion of time to be spent in sleep.

*Moisture is equally necessary to be con-*

sidered in this place, with respect to its effects on the health, as *heat* and *cold*. This, I have before observed, cannot be always avoided, but the bad effects it sometimes produces may generally be obviated. If those who are wet with showers, would be careful to continue their motion and labour whilst they remain in the open air, and to change their clothes on their return home, many of the bad consequences of wet clothes would be prevented. Friction, on such occasions, might be an excellent preservative against the bad effects of cold and moisture: were the body and extremities that have been so exposed, rubbed strongly for a quarter of an hour with a coarse woollen, or linen cloth, immediately on the wet clothes being stripped off, it is probable few bad consequences would follow from the accident.

It is indeed extraordinary this should not be oftener practised in such circumstances than it is. Every labouring man knows the necessity of rubbing horses that have been wet and dirty, and this not only for the purpose of cleansing away the filth, but also for that of preserving a due perspiration and regular warmth on the surface of the body,

Bathing the feet in warm water would also be an useful precaution on such occasions, especially to those who are subject to purging and other disorders of the bowels.

Labouring men are sometimes exposed to moisture of a less innocent kind than such as falls from the clouds. Draining marshy ground is a necessary business, and, as I have before said, exposes the workmen to hazard from the nature of the moisture, as well as from simple humidity. The intermittent fever is the principal, though not the only complaint, work of this kind is liable to bring on, and must be particularly guarded against. It therefore seems proper that such kind of work should, if possible, be performed in the spring, or early in the summer, in which seasons these disorders are not so likely to happen as when the autumn is advanced. And those who work in this way should be sufficiently clothed, and be very cautious to avoid sudden transitions from heat to cold.

*Intemperance* is particularly dangerous under such circumstances. It is highly proper, and even necessary, that those who perform such kind of labour should have a sufficient, and

even liberal allowance, in point of diet ; but excess of any kind, in spirituous liquors especially, tends to weaken the stomach, and in consequence thereof, the whole vital system, and to render the body more liable to receive contagion of every kind. This is not a caution founded merely on theory or general principles, but a fact in medicine established beyond all doubt.—Another caution very necessary to be attended to is, that none should go to such kind of labour in the morning before they have taken some kind of food. Somewhat warm is most proper, and if it can be had, I should prefer animal food. It is difficult to account for, but true as a fact, that warm victuals are greatly more cordial and strengthening to the body, and of course more fit for the support of those who perform laborious work, than the same food if taken when cold.

*Cleanliness* is an essential article in such circumstances. Would those who work at such employments be careful to wash their hands and feet at their return from work, and to change their linen and stockings as often as their circumstances would admit, it is probable that the hazard would be greatly lessened.

It is necessary to remark, that the above cautions apply at least equally strong to those who superintend such operations, as to those who actually perform them. It is probable that the labour of body and attention of mind, which occupy those who are at work, is no small preservative against the access of contagion of every kind.

As there is reason to believe, that intermittent fevers may, in some cases, be so far infectious as to be communicated from one person to another, it would be proper that when any person should be attacked therewith, such person should be provided with a separate bed during the continuance of his disorder. Cautions of this kind would be the best economy, as disorders might then be checked at their first appearance, and prevented from spreading.

*Excess, or Irregularity in Diet,* is the next subject of these cautions. I have before mentioned some of the disorders likely to be produced hereby, but shall now be more particular. Food may be considered with respect to its *quantity* and its *quality*. The first of these can only be measured by a reasonable atten-

tion to the appetite. What may no more than suffice for one man, may be great excess in another; and in general what the appetite leads to, may be considered as the proper standard. But some ignorant rustics are foolish enough to imagine, that there is a degree of credit annexed to the being able to consume a larger quantity of victuals than is in the power of other men; and this beastly prejudice, which often produces fatal consequences, should be as much as possible discouraged, even by those who practise hospitality among the lower ranks of people. It is certainly mean to offer to entertain any persons, of whatsoever degree they may be, without producing a sufficient quantity of wholesome provisions; but it is still more inhospitable to encourage any to make such an use of what is provided for them, as to endanger health or life, not to mention the scandalous waste which must be caused by it. Still more blamable is the practice of encouraging gluttony by wagers, or offers of reward. They who do this, are in fact highly criminal, and in no small degree guilty of the fatal consequences which so often follow such brutal displays of appetite. Moderation is not only necessary in what regards the quantity of food,

but also as it regards the time in which it is consumed. It is necessary to the proper digestion of our food, and of course to the nourishment of the body, that it be taken in gradually, and its texture broken down by chewing. It would scarcely be credited, were it not known as a fact, that the folly of gluttony has prompted wagers not only on the quantity of food, but also on the time in which it should be swallowed ; by accelerating which, all the bad effects of an enormous quantity of victuals must be greatly aggravated. Meat, thus swallowed, must be of course in large pieces, scarcely acted on by the teeth, and of difficult digestion. The sudden distention of the stomach, by the introduction of a large quantity of meat so nearly at the same time, must weaken its tone, by overstretching its fibres ; and this has sometimes gone to such a length as to deprive the stomach of all that power of expelling its contents, which soon terminated in death.—To these dangers should be added, that of the meat sticking in the passage of the gullet, and remaining there without a possibility of removal, a thing which is not uncommon amidst such excesses. Even the proper temperature of food is worthy attention. Rustic folly

has produced wagers and premiums on the eating food nearly boiling hot. It is difficult to preserve any temper in the censure of such outrageous stupidity.

The quality of food is necessary to be considered, as well as its quantity. The stomachs of labouring men are undoubtedly strong, and able to digest coarse meat; but ill-judged economy should not prompt farmers to set before their servants decayed or indigestible food. Putrid meat is not merely unwholsome in its remote consequences, but immediately dangerous to life, as has been often experienced, and should be avoided as carefully as we would any other poisonous substances.

I have before pointed out the bad consequences that are apt to result from the free use of some indigestible fruits, particularly plums and nuts. I think it would be a proper caution for farmers not to plant any of the former that are of the coarse and austere kind; for though they generally bear plentifully, their fruit is of little value, and likely, on that account, to fall to the share of such people.—Hazel plantations are more ne-

cessary; but still it would be of service to place them as far from farm-houses as might be convenient, that they might afford less temptation for the gathering of their fruit. It is proper to notice here, the danger thoughtless people who spend much time in the fields are exposed to, from eating plants and berries with which they are unacquainted. Many plants, commonly met with, are well-known to be extremely poisonous, such as the Henbane, Deadly-nightshade, Water-hemlock, some species of Drop-wort, several kinds of Mushrooms, and many others. It should be a strict injunction to all who spend their time in the fields, never to taste any plant, fruit, or berry, which they do not know to be safe, and indeed it would be more prudent to discourage altogether such useless curiosity. It is obvious that this caution is particularly necessary for children.

The danger of excess in liquids is greater than in solid food. Fermented liquors, taken in moderate quantity, are both proper and necessary for those who perform laborious work; but this healthy proportion is apt, when opportunity offers, to be exceeded by people whose gratifications are few in number, and of

rare occurrence. As it is impracticable to prevent such excesses altogether, I would wish to suggest, that, if they must take place, malt liquor is found by experience to be much less injurious to the health and constitution than distilled spirits, however diluted with water. I have been informed that a principal of economy has induced many farmers to treat their servants, and those with whom they are connected, with spirits and water, instead of malt liquor; but such a practice is by all means to be discouraged, as spirits are much more inflammatory than malt drinks, and produce more ready obstructions and inflammatory disorders, especially of the liver and mesentery. The temporary delirium of intoxication that they produce, is said to be much more violent and outrageous, and of course more dangerous than what follows from taking too large a quantity of malt liquor. The destructive effects of spirituous liquors were so observable some years ago, as to produce the most serious apprehensions in a national view, and to attract the notice of the legislature.—The baptisms of London alone are said to have been reduced from twenty thousand annually to fourteen thousand, which was, with reason, ascribed to the use of this pernicious beverage:—This

fact is equivalent to a thousand arguments ! On this subject I would wish to say a few words on the debauchery that usually attends county elections, especially such as are contested.

Much has been said of late years on the subject of instructing Members of Parliament. No condition would be more justifiable than to demand of all the candidates a promise that they would not, by encouraging debauchery, ruin the health, destroy the industry, and corrupt the morals, of those people for whose interest they profess such an anxious concern, and to whose service they are so profoundly devoted. I believe it will not be thought going too far to affirm, that very few indeed have it in their power to repair, by any political conduct of their own, the mischief done by a contested election. No combination among the electors could be more truly patriotic, than one which tended to refuse support to every candidate that attempted to promote his interest by such means.

In the former part of this essay, I have mentioned some of the ill effects that follow violent exertions of labour or exercise, which

I trust are sufficient to show the imprudence of such strained efforts. I shall only add here, that such trials should not be encouraged by premiums or other means, either by private persons or public societies. It would be far preferable to encourage constant and persevering industry and good execution of work, than excessive labour and fatiguing exertions of strength. I shall conclude this chapter with some pieces of general advice.

Those who employ servants in agriculture, should encourage them to be careful of their health, and to make it a point of consideration. A proper prudence in this respect is perfectly consistent with industry, and is indeed the most necessary circumstance towards the execution of a great quantity of work.— It is common with agricultural societies to give premiums for the greatest number of children ; but this should always be conjoined with another condition, that the children should be healthy, and this last circumstance should preponderate against the other.

The situation of *farm-houses* is a matter of great consequence as it regards health. The greatest care should be taken to place them in

dry situations with a descent from them every way, and upon a gravelly spot, or at least such a one as is free from springs that rise to, or near to, the surface of the earth. Care also should be taken to place the repositories for dung, and other manure, at some distance from the house, and this caution should also be extended to the hog-styes and poultry-yards. The necessary attention to the feeding these animals, does not allow the distance to be considerable, but still does not require their being so near as we generally see them placed. It is needless to expatiate on such a subject, or to attempt to prove that air, impregnated with such filthy exhalations, must be injurious to health.

Even good plans for farm-houses of different sizes, according to the number of inhabitants, would contribute, in no small degree, to general welfare. The bed-chambers in farm-houses are in general too low and confined, and the whole building too small; this occasions too many people to be crowded together, a circumstance always very unfavourable to health, and the most common source of contagious disorders. Good water is also a circumstance of great moment. If this can be

had from any spring that rises to the surface of the earth, it is commonly preferable to such as is drawn from a considerable depth; but such a choice is not always in our power. If pond water be used through necessity, it should be previously put into cisterns, or reservoirs, covered at the top, and there suffered to settle. Care should be had that the water be taken from a large pond, with a stony or gravelly bottom, and not subject to become putrid. Those who drink water of this kind, should beware of swallowing the eggs or spawn of animals, leeches particularly, which sometime have produced, it is said, disagreeable symptoms.

Cleanliness of the person is of greater importance to health than is generally imagined, and ought to be particularly encouraged among the lower ranks of people, especially those employed in this way. Nothing seems more likely to contribute to this salutary purpose than a due observation of Sunday; this precept is not only conducive to religion, morals, and civilization, but also to health.—It is well observed by Mr. Addison, that Sunday clears away the rust of the whole week;—an expression which may be under-

stood to extend to cleanliness as well as other considerations, and indeed appears to have been so intended by the amiable author in the passage referred to.

I now come to the last part of this essay, which is to speak—*Of the Cure of the Diseases to which Agricultural Persons are subject from their way of Life*: and here I must remind the reader, that the present treatise is not meant to be a discussion of the subject at large in a medical way, but only to contain some plain hints and directions of the practical kind, which I believe to be justified by reason and experience.

Persons employed in daily labour of a healthy kind, and living on coarse food, naturally become robust and athletic, of a firm fibre, and dense blood. Hence inflammatory complaints are in such habits more common than those of the putrid kind; and such as are attended with low spirits and other hypochondriacal symptoms, are rarely met with. Evacuations may of course be used with more safety among such people, than among the effeminate inhabitants of populous towns.

Bleeding, in the fevers that occur among country people, is for the most part necessary, especially in such as are attended with local inflammation, as pleurisy, peripneumony, or inflammation of any of the viscera. In such cases, twelve, fourteen, sixteen, or even twenty ounces of blood, may, and often ought, to be drawn at one time. The quantity, however, cannot be determined by any general rule, but must be regulated by the age, strength, sex, and constitution of the patient, but principally by the urgency of the symptoms. If the internal pain be very acute, the skin hot and dry, and the pulse exceed 110 beats in a minute, a large bleeding is generally necessary, especially if any other symptom of a fatiguing or dangerous kind, as a violent cough, or shortness of breath, be present.

It is proper here to remark, that as soon as the nature of the complaint is so far ascertained as to prove bleeding to be indicated, it is of consequence that such operation be performed as soon as possible, and that a sufficient quantity be drawn at one time. One plentiful bleeding will sometimes subdue a disease at its first appearance, when if half

the quantity only had been taken, it would have required perhaps to be repeated several times.—It often, however, and indeed generally happens, in fevers attended with local inflammation, that one bleeding, however judiciously managed in respect of quantity, is not sufficient. In such cases we must be governed nearly altogether by the urgency of the symptoms, and when these indicate a farther evacuation to be necessary, we must proceed, not indeed without regard to other circumstances, but nevertheless as considering them subservient only to the principal object. An attention to this circumstance is especially proper, when the parts that are the seat of the complaint are immediately necessary to life, as in inflammations of the brain, lungs, bowels, or any of the viscera; in such cases there is no time to be lost, and what many would think bold practice, is indeed the only means of escape.—It is proper indeed to be careful, that the complaint originally be of such a nature as to require bleeding at all; and in this, it must be confessed, even the most acute persons of the profession have been deceived.—The intermittent fever sometimes comes on with such violent symptoms, as to resemble very strongly an inflammatory fever.

But a little time generally resolves the difficulty, and the successive and clear marked stages of *cold, heat, and sweat*, are for the most part sufficient to determine the nature of the disorder, even before any intermission takes place, and any necessity of beginning to treat it as a fever of a different kind. Even if it should be mistaken, and some blood drawn, this evacuation has been often found serviceable in the beginning of *intermittents*, when the symptoms are violent, and is recommended on such occasions by the most judicious practitioners. A careful examination of circumstances will, for the most part, enable us to distinguish this disorder at its first appearance.—Moist weather, and a season of the year about either the vernal or autumnal equinoxes, the latter especially, and the frequency of the disorder in the neighbourhood, afford strong presumptions in favour of a fever being of the *intermittent* kind;—to which we may add, such observations as may be drawn from the nature of the soil and situation, and the business or work in which those attacked with the complaint had been employed, previous to its first coming on.

It is an opinion generally received, that if

bleeding be omitted at the beginning of fevers, it is improper in their advanced state, and this is in some measure true. Fevers that commenced with inflammatory symptoms, often become putrid as they proceed, and bleeding is certainly improper in such circumstances. But I would observe, that this caution holds more strongly with regard to the enfeebled inhabitants of towns, than for robust country men. I apprehend that bleeding, though certainly more likely to be of service if tried at the beginning of the disease, is nevertheless proper at every period when inflammatory symptoms are present. This holds more strongly in cases of fever attended with local inflammation, as in pleurisy, inflammations of the viscera, &c. in which the propriety of bleeding at every stage, provided the symptoms are urgent, is universally acknowledged. It sometimes happens in robust people, that the common inflammatory fever preserves its original appearance nearly as long as life continues, and its change of type is not to be regarded so much as an indication that points out the propriety of a different method of treatment, as a sign that all our attempts are likely to be in vain.

Topical bleeding is often of great service in many disorders, as well as general bleeding, especially in the removal of some troublesome and distressing symptoms. The head-ache is frequently an attendant on fevers, and often continues when the heat, quickness of pulse, thirst, and other symptoms, are much abated; and may be often thus relieved.—One of the easiest and safest methods of partial, or topical bleeding, is by the application of leeches. If 3, 4, 5, or 6 of these, be applied to the temples, in the cases mentioned above, they will often procure almost immediate ease, and are perfectly safe in their application, as the quantity of blood each of them draws is very small. Leeches may often be applied with great success in many inflammatory complaints that show themselves externally, as rheumatic swellings, particularly those of the face and cheeks, inflammations of the eyes, inner parts of the ear, &c. In every instance they should be applied as near as possible to the part affected. Bleeding, however, though a powerful remedy, requires some judgment and caution in the application of it.—The fevers that appear among country people, though often inflammatory, are not always so. Putrid fevers, though scarcely natural (if such

an expression may be admitted) to a country life, are nevertheless capable of being communicated by contagion, and in such cases bleeding is generally hurtful. In some instances the putrid and inflammatory symptoms are so combined, as to make it doubtful to which class of symptoms we ought principally to attend, and in such cases some experienced person should be consulted; but in general the sudden debility of body, and dejection of mind, that usually come on at the access of the fever, the red watery eye, and the tendency to perspiration or other evacuations, sufficiently distinguish this complaint from those of the inflammatory kind. The nervous fever seems to be only an inferior degree of the putrid or malignant. It is principally distinguished by the weakness and dejection of mind that attend it.

The ulcerated sore throat is another complaint that may be found in every situation, as it is capable of being propagated by contagion. The difference of this from the inflammatory sore throat is now well understood, and generally known; but there is another complaint that resembles it very much, which requires a very different mode of treat-

ment, of which I shall speak hereafter. In both, however, bleeding is improper.—No case requires the use of the lancet more than the common cold, if attended with cough and pain of the breast or side. These symptoms, if neglected, frequently terminate in consumptions, which might easily have been prevented by some evacuation of this kind, joined to common care, whilst the complaint was recent.

An absurd custom prevails among the common people, of letting blood about the spring and fall of the year, whether they have any complaint that requires such evacuation or no; this practice, however, so far from tending to prevent disorders, contributes greatly to produce them. It causes an habitual plethora, impoverishes the blood and juices, and when done at the latter end of the year, is apt to dispose the body to intermittent fevers; and, if often repeated, to dropsical complaints. Many other bad effects of this absurd practice might be enumerated, but they are, I think, unnecessary to mention.

Purging is a mode of evacuation, whose consequences in inflammatory complaints are

often important, though less so than bleeding, and I think less hazardous, if misapplied. Almost every inflammatory complaint requires some operation of this kind ; it is, however, in general, proper to be preceded by bleeding, which is thought to make it more safe and effectual : but this rule admits of many exceptions, and is not necessary to be adhered to, except the tendency to inflammation prevail pretty strongly.

It was formerly thought, that purgative medicines differ considerably in the nature of the discharge they produced ; some being calculated to discharge water, others bile, others phlegm, &c. ; but modern practice does not admit of much difference in this respect. All purgatives evacuate the bowels, and, if powerful and stimulating, produce a watery discharge, by the absorption they occasion from the lymphatic system. Notwithstanding this similarity in the effects of purgative remedies, they differ considerably with respect to the circumstances that attend their operation. Some purgatives are observed to stimulate the body, and accelerate the pulse during their operation more than others ; and this is an important circumstance to direct our choice

of them, according to the purposes for which they are intended. Those that operate with least irritation to the system, especially to the circulation, are preferable in acute complaints; and nothing in such cases is better than a simple solution of the bitter purging salt in water. It is seldom rejected by the stomach, however unpleasant it may be to the taste, and its operation is effectual, and takes place quickly; a circumstance of great importance in such cases. From one to two ounces may be safely taken dissolved in a pint of warm water, in all inflammatory complaints where purging is proper. If it should be necessary to repeat it in the advanced stages, when the feverish heat begins to subside, it may be taken dissolved in the same quantity of infusion of flowers of chamomile, which will conduce to support the tone of the stomach, without obstructing the evacuation.—The same remedy is proper in such fevers as are attended with local inflammation. If given early in such complaints, it will generally procure a passage, being quick and effectual in its operation, and found, by experience, to be less liable to be thrown up than things much more pleasing to the taste. The use of this medicine is not only advisable in continued

fevers, but also in the beginning of intermit-tents, when the patient is strong enough to bear purging. But of this I shall say more when I come to speak of the use of the Peru-vian bark in that disorder.

In the advanced state of all fevers, when the inflammatory disposition begins to abate, and a tendency to putrefaction to prevail, the saline purgatives in general are less proper than such as are of a more warm and stimu-lating nature. Rhubarb, in such cases, is more proper, as being warm and aromatic, at the same time that it is purgative. If it be required to be made warmer, one-half, or one-third part of nutmeg, or any other spice, may be added; from 20 grains to 60 may be given for a dose, but this must vary accord-ing to circumstances.

It is a perplexing circumstance attending the giving purgative medicines internally, that we cannot determine the degree of their ope-ration by the proportion or quantity that is taken. It généralement happens, that one-half, or two-thirds of the usual dose will have little or no effect; whereas had the full quantity been taken, it would have produced a larger

discharge than might be desired. In cases, therefore, where some evacuations of the bowels is necessary, and at the same time we might be apprehensive of any unpleasant effects from a large discharge, it is proper to employ clysters, which have an additional advantage, that their effect takes place in a much shorter time than could be produced by any purgative medicine internally taken. When clysters are administered with this intent, there is no great necessity to be very particular in their composition. A pint of warm gruel or broth, with two spoonfuls of sallad oil, or melted butter, a table-spoonful of common salt, and the same quantity of brown sugar, forms as efficacious and proper a clyster as the most laboured composition.

It is proper, while upon this subject, to caution against the practice of giving purgative medicines internally, especially such as are of the heating, or stimulating kind, commonly called warm purgatives, to people who complain of pain in their stomach, or bowels; particularly if this pain be attended with heat, thirst, or other symptoms of fever. It is much the safer practice to inject a clyster of the kind beforementioned, and to repeat it

if necessary, and to use external fomentations, than to enter precipitately on the use of purgative medicines, which, if they do not take effect, often aggravate the mischief, by producing or increasing a disposition to vomit, and sometimes totally inverting the peristaltic motion of the intestines. If sufficient stools can be procured by clysters, the danger is generally over; but if that means of relief do not succeed, it is safer to apply to some of the profession, who may best determine what method may be pursued.

It is of the utmost consequence to mention, that when any complaint of violent pain in the stomach or bowels is made, especially if such pain be not accompanied by stools, we should inquire first about the place in which it is chiefly felt, if that can be pointed out; and next, if it came on rather suddenly, or soon after performing some laborious work, especially the lifting any great weight, or indeed any considerable exertion of strength. If this be found to be the case, we should carefully examine the belly, especially that part nearest to the seat of the pain; and if any swelling, or lump, however small, be found, even of the size of a hazel-nut, we may be almost certain,

that the cause of the complaint originates from thence, and that if it be *immediately* attended to, it may *probably* be relieved, at least the present danger obviated ; but that if it be neglected, the patient will almost infallibly die. The only remedy on such occasion is, to restore the portion of the intestine, which is thus protruded and compressed between the muscles of the abdomen, again into the cavity of the belly ; and if this be done *soon* after the accident, it produces no farther injury. But this must be understood of such cases only as have a quick attention paid to them, since if any delay is made, the danger increases very rapidly : even a few hours may determine the interval between safety and death.—If the patient be in the vigour of age and strength, the consequences of neglect are more to be apprehended, than if he were advanced in years, as the probability of inflammation and stricture upon the intestine is greater.

The apparent facility and celerity with which this operation is often performed, and its great simplicity, may induce some people to attempt the performance of it, who have had no instruction or experience relative thereto ; but it is proper to caution against

such attempts, as much nicety of touch, and address of management, are often requisite; and if the part be rudely, or injudiciously handled, the hazard of the disorder is much increased. The parts where such an accident is most liable to happen, are the navel and the groin, but this rule is by no means universal.

It is farther necessary to remark, that women, who in country business are often employed in lifting considerable weights, as of pails of milk, buckets of water, and such like, are more liable to ruptures than men; and on that account it is highly necessary that whoever attends women labouring under any acute pains of the abdomen, should make a strict inquiry into the circumstances under which such pains originated, and particularly if there be any tumour in the groin, belly, or pudenda; and if there be such, to be informed of what nature it is, before he goes any farther, or loses any more of that time, which in such cases is so very precious.

To return now from this rather long, but I hope not useless, digression.

*Emetics* are another class of medicines of  
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the evacuatory kind, that are often of the greatest importance, and whose use requires the particular attention of those who give advice to sick persons. It is not meant here to give a general account of the causes or circumstances in which emetics may be administered with propriety, but only to give a few hints relative to the cases that are most likely to occur in such situations, in which those remedies may be useful.

First, then, emetics are indicated in cases where, from imprudence or negligence, any thing has been swallowed, that we have reason to believe would be specifically injurious by its continuance in the stomach. Thus if any poisonous plant, root, or berry, as of henbane, dropwort, nightshade, or such like, has been incautiously or ignorantly taken, our principal security depends on such poisonous substance being evacuated as soon as possible, and this can only be done with safety by means of emetics. A scruple, or half a drachm of powder of ipecacuanha, together with a grain of emetic tartar, may be safely given on such occasions to an adult person, and worked off with a strong infusion of chamomile flowers, or of root of horse-radish. This accident is

most likely to happen to children, with whom the same remedy may be tried; some diminution in the dose may be proper; but in such dangerous cases it is better to give a full dose, and the rather as by the quicker and more effectual operation of a larger quantity, the emetic substance itself is sooner and more completely discharged, and in general with greater ease to the patient, than if a small dose had been employed. The same remedy may be taken when the stomach is overloaded by excess of food, or by any victuals that disagree.

With the same intention, emetics may be given when by some violent debauch the stomach is deluged with strong liquors, and the insensibility may be so great, that it may be apprehended life is endangered. A quick and effectual evacuation of the stomach is sometimes of great consequence in such cases, and serves to rescue such unwary persons from impending destruction. When the stupor prevails so far as to prevent swallowing, a few grains of emetic tartar conveyed to the back part of the tongue will find its way into the stomach, and in most cases, where that organ retains any sensibility, produce vomiting. A

few grains (three or four for instance) of blue vitriol may be used for the same purpose, and in desperate cases is preferable, as possessing a stronger emetic quality.

It must however be observed, that it is not always either advisable or safe to give vomits to remove substances that have got into the stomach, that we apprehend may do mischief by means of their mechanical stimulus, as pieces of bone, pins, or other sharp or pointed bodies, that may have been swallowed. The contraction of the stomach that necessarily attends vomiting may, if the substances be not discharged, aggravate their bad effects, and cause mischief by pressing on such substances; which might not have happened, had they been left undisturbed.

But the use of emetics is not confined merely to cases where we desire to empty the stomach, on account of any foulness supposed to be lodged there. They are often of the greatest service when given at the coming on of feverish complaints, whether these be intermittent or continual fevers. In both of these, it is usual for some degree of nausea, or sickness of the stomach, to accompany the cold fit,

which it is proper to encourage, should it not come to an actual vomiting. An infusion of chamomile is often sufficient for this purpose; but if that fail to excite a complete discharge, a scruple of ipecacuanha in powder will assist the discharge sufficiently, effectually, and safely.

Emetics are often of service in the common catarrhous cold, when the glands of the throat and fauces are deluged with mucous phlegm, which is often very difficult to be spit up. In these cases, an emetic often acts in the most powerful manner in unloading the glands, and promoting general expectoration.

About ten years ago, a disease appeared in the Midland counties, much resembling the ulcerated sore throat, but differing from it in reality, and requiring very different remedies. This was called the sore throat, attended with scarlet fever, and raged principally in the summer and autumn, in hot and dry weather, and attacked principally robust and vigorous people. Vomiting, in this disorder, proved a very effectual remedy, and required to be frequently repeated, during the heat of the disease, even in bad cases, as far as twice in

twenty-four hours. Should the same complaint again become epidemic, the early administration of emetics will probably be of the utmost consequence, and ought to be carefully attended to. It was found necessary to use such as were of a powerful kind, otherwise little benefit was received.

The above are far from being the only cases wherein emetics are useful, but such only as occur to me wherein they may be administered without hazard of being injurious, and have a probability of being of service. It will be proper here to offer some *Cautions relative to the Dose and Management of Emetics.*

First, then, I apprehend that it is a mistaken notion that gentle emetics, as they are called, are milder in their operation than the more powerful. A small quantity of ipecacuanha often causes a most troublesome nausea and retching, for a long time together, owing to its not possessing a stimulus sufficiently strong to cause a complete evacuation of the stomach. A strong emetic, on the other hand, by clearing the stomach in a few efforts, is itself discharged, and of course gives no farther trouble. A scruple of ipecacuanha, in general, operates

with much less pain and fatigue than five or ten grains, and the operation is sooner over. It is proper to add a portion of some antimonial preparation to the ipecacuanha: a grain or two of emetic tartar, or a drachm or two drachms of antimonial wine, serve the purpose equally well. They are of service in clearing the stomach more completely than ipecacuanha would do if given alone; and on the other hand, the ipecacuanha causes the antimonial medicines to operate with greater certainty as emetics, which would otherwise often go off by stool.

Another caution I would recommend is, to wait patiently for the operation of the emetic, and not to attempt by any mechanical means, as tickling the throat with a feather, or with the finger, to cause retching before the sickness is sufficiently strong to excite vomiting freely. It is better even to repress the first motions to vomit, and wait till they become sufficiently strong to be effectual.

It is somewhat remarkable, that the addition of antimony to ipecacuanha, though it certainly causes a more full evacuation of the stomach, seems to retard the operation in some

measure. Ipecacuanha given alone, generally causes sickness in the space of fifteen or twenty minutes ; whereas, if antimony be added, that effect seldom takes place under half an hour or forty minutes, and often longer.

Another caution is, for those who take emetics, not to load their stomach with large quantities of warm insipid liquor, under the notion of working off the vomit; warm chamomile, or horse-radish tea, or a mixture of both, is preferable to gruel or warm-water, as not relaxing the stomach so much as those weak tasteless liquors.

Lastly, it should be considered by all, that the habit of taking emetics is of itself very weakening to the stomach and powers of digestion: occasionally used, they are in most cases a safe and powerful remedy, but frequent repetition causes them to be less beneficial, and in time hurtful.

Medicines that cause sweat, called in medicine *Diaphoretics*, are next to be considered. The use of these, though not so general as was formerly thought, still forms an important indication. The common catarrhous cold is

more effectually relieved by promoting this evacuation than by any other means, and the same was observed of the influenza, when that complaint was epidemic some years ago. Rheumatic complaints are also benefited by it, and many other slight febrile complaints. Nothing, however, has been more mistaken, than the most effectual means of producing this discharge. External heat is generally thought necessary; but it has been discovered of late years, that the body may easily be made too hot to sweat, and that there is often no method more powerful than by diminishing the heat of the body when too great, and that it is often necessary, in order to promote perspiration, to take off part of the bed-clothes, diminish the heat of the room by removing the fire and opening the windows, and to give cool liquors to the patient.—Nothing succeeds better with this view in the common catarrhous cold, which requires some discharge by perspiration as much as any complaint whatever, than to bathe the feet at night for a quarter of an hour in water made about blood-warm, and to take a moderate dose of spirits of hartshorn in a pint of warm whey, gruel, or infusion of some garden herbs, as balm, mint, &c. This is perhaps the safest

method of any; as whatever the nature of the disease may turn out afterwards, no injury can arise from what has been done.

In rheumatic cases, it may be necessary to employ diaphoretics of a more powerful kind, and for this purpose *Dover's Powder* is frequently given, and often with good effect. It is given from five to fifteen grains, and may be continued every night, or every other night, for ten days or a fortnight, if the discharge by the skin be not too great, and the painful symptoms continue.

It is proper here to speak a few words on the subject of that popular remedy, *Dr. James's Fever Powder*. This is well known to be an antimonial composition, less stimulating to the stomach and bowels than emetic tartar, and on that account preferable where any permanent effect is desired. It often acts as an emetic or a purgative, as well as a diaphoretic; but the last effect is, I think, more common. In fevers of the inflammatory kind, and such as are commonly found in country places, it is, if given with any tolerable caution, an excellent remedy, taking off the feverish spasm, unloading the stomach and

bowels, and as it were giving an opportunity for the exertions of nature. It is best given at the beginning of feverish complaints, before they alter their tendency from an inflammatory to one that is putrid. If the inflammatory symptoms are violent, it is safer to use some previous evacuations by bleeding, and a clyster; after which from five to twenty grains may be given, according to the strength of the patient and urgency of the symptoms. It is given with most advantage in cases wherein the patient is able to bear considerable discharge by stool; but it is remarkable that these seemingly distressing operations are soon recovered, and the patient appears in many cases the stronger on their account. The sickness also caused by this medicine, however uneasy to bear whilst it lasts, generally leaves the stomach in a state fit for the receiving of nourishment; an inclination for which is, in many instances, one of the first marks of benefit received from the use of this remedy.

It sometimes happens, that this medicine, though given to its full quantity, produces no sensible effect of any kind. Whether this be owing to any defect in the preparation, or to

any insensibility in the nerves of the stomach at such times, I cannot determine. It is however in such circumstances necessary to forward its effects, since if it remain inactive in respect of producing some evacuation or other, it seldom is of any service. If the stomach appears to be loaded, a scruple of ipecacuanha may be given, joined to a grain of emetic tartar, which generally takes effect, and sometimes seems to excite the action of the powder. If we wish to determine its action downward, an ounce or six drachms of the bitter purging salt may be taken, and a clyster of broth and common salt thrown up.

As to the mode of exhibiting this medicine, I have before observed, that it may be taken from five to twenty grains at a dose, and is most conveniently given in something of a viscid consistence, as pulp of roasted apple, currant-jelly, or the like. If put into any thin fluid, as tea, it is apt to sink to the bottom, being of considerable specific gravity, and indissoluble in any watery fluid. It has been a great injury to medicine, that this preparation should have been kept so long as an empirical secret. It has been by that

means extolled in complaints in which it had no salutary efficacy, and was even liable to prove injurious. It is impossible that any medicine can be suited to every kind of fever. Some require immediate and large evacuations; in others, such a treatment tends infallibly to destroy the patient; and there is no doubt that the indiscriminate recommendation of this remedy, which generally acts as a powerful evacuant, must have been the cause of many lives been sacrificed to pecuniary interest. Such a remedy, however suited to disorders where a quick and powerful evacuation is required, is utterly improper in cases where the powers of life are much reduced, and where the utmost attention to support the strength of the patient is necessary. This is always the indication in fevers of the low, nervous, and contagious kind, and is frequently the case in the advanced state of fevers in general, whatever might be their tendency at their first appearance. Even in the rheumatism, which is of an inflammatory nature, though often chronical in point of its duration, this medicine, though often serviceable at the beginning, must not be continued very long, as it is found, like the other antimonial preparations, to injure by

long use the tone of the stomach and powers of digestion.

The high, and as it might justly be called extravagant price of this remedy, which bore scarcely any assignable proportion to its intrinsic value, has caused its use to be less general among the poor than humanity would desire. That objection is now, however, superseded; the powder being now sold at Apothecaries-hall, for less than one-twentieth part of its former price; and this powder is found, on the most impartial examination, to be fully equal in every respect to that sold under the denomination of *James's Powder*.

*Diuretic Medicines* form a class of remedies, whose effects would be very desirable, were they not so precarious. No diuretics that we know are much to be depended upon for certainty of operation, especially in such cases as we most desire to have it. Those that are safest, and least offensive to the stomach, are, the sweet spirit of nitre, and the sweet spirit of vitriol, which may be taken in the dose of a tea spoonful in a glass of water, or other cold liquor, once or twice a day, and continued for two or three weeks. Some

of the vegetable infusions, as of horse-radish and mustard-seed, will sometimes produce the same effect, and may be continued, if successful, a long time, without injury to the constitution or health in other respects. The infusion may be made by pouring hot water on the mustard-seed bruised, and horse-radish fresh scraped, and letting them stand together a few minutes. An ounce of each of the ingredients is enough for a quart of water; and about a quarter of a pint of this infusion may be taken twice a day.—The above infusion, or one similar to it, is often used with success in the swelling of the belly and legs, which often succeeds obstinate intermittent fevers, and is generally attended with thick turbid urine, which is secreted in small quantity. This preparation, though apparently simple, is as likely to succeed as many others that are more compounded, and may be safely tried in all cases where the urinary secretion is defective.—It is proper, however, to caution against the giving diuretic medicines of any kind, when any pain, or heat of urine, accompanies the diminution of its quantity. In such cases, opiate and emollient remedies are proper, joined with such as abate inflammation.

Having thus spoken of medicines that produce evacuation, I shall now speak of those which stimulate, and call the powers of life into action.

*Stimulant Medicines* may be considered, in practice, as of two kinds; one of which tends to give a permanent support to the vital powers; the other tends to excite their action in a more temporary manner. Of the former of these, wine, when good, is perhaps the most generally useful in cases of emergency. It is now found, that, in low and putrid fevers, wine may be given with great advantage in larger quantity than was formerly thought practicable with safety, even to two or three bottles in twenty-four hours. Nay, larger quantities have been administered, but it has been found, that even a proper remedy may be over-dosed, and that such quantities as I have above specified, should be cautiously ventured on, and not without attentively observing the effects of each dose that is taken. The best way of giving it is, I think, in small quantities, and frequently, and as fresh from the cellar as possible, perfectly cool, and without any admixture.

In fevers, where the skin is moist, with a scalding heat to the touch, the pulse quick and low, the eyes moist or watery, the stools loose and fœtid, thirst great, tongue foul, respiration difficult, and spirits depressed, the use of the wine is advisable, and is indeed the principal remedy on which we must depend. The indication for wine is stronger, if any spots of a blue or purple cast appear on the body, or if a low muttering delirium come on, attended with faintness. Life then depends on active and quick exertions. Most fevers that are contagious are of this kind, particularly that called the *Jail Fever*; and the same method of treatment is necessary in some measure in most acute fevers that last beyond eight or ten days, without some evident signs of abatement. The marks whereby we may judge wine, when administered, to be of service, are, a cessation or diminution of the pain in the head, or delirium, diminution of the heat and clammy sweat, and by the patient being in better spirits, and entertaining hopes of his recovery. It often happens, that fevers of this kind, when they begin to abate, assume somewhat of an inflammatory appearance, the skin becoming hot and dry, and the pulse full and quick. These symptoms are

not unfavourable, and generally abate of their own accord. They indicate, however, that wine should be more sparingly given, if not totally laid aside, during their continuance.

If wine cannot be had, or not in perfection, or is not relished by the palate, good malt-liquor may be substituted in its room; and I have seen porter tried with the best effect in a case of this kind. The patient drank about three quarts a day for several days, and it seemed to agree better than wine or any other medicine, and was, after the second day, the only remedy administered. I have some reason to think, ale, or strong beer, might be used with similar effect; but have never had any personal experience of their efficacy. The Peruvian bark is used with the same intention in the same disorder, and with good effect. But it is now thought that wine is full as powerful, and much more easily administered, as being more grateful to the palate; a thing of great importance, where the frequent repetition of a medicine is necessary. The use of the bark is, therefore, in a good measure superseded in putrid fevers, except where the throat is ulcerated; in which complaint it

has been found, by experience, to be particularly useful.

The principal use of the *Peruvian Bark* is in the intermittent fever, the returns of which it is well known to be very efficacious in preventing. It is best given in substance, and most conveniently in form of an electuary, made up with any syrup, and with the addition of some spice, as a little nutmeg, or cinnamon, in powder, to each dose. If the patient be strong, and the body costive, a small quantity, (a drachm for instance,) of Glauber's salts, or the bitter purging salt, may be added to the three or four first doses of the bark, which generally opens the body, and promotes urine; but if the disorder be advanced, or the patient weak, or in years, such addition is less proper. If the bark purges, such tendency must be moderated, which a few drops, (two or three, for instance,) of liquid laudanum in each dose generally does very effectually; and when that disposition is conquered, the laudanum must be omitted. The bark must be given in considerable quantity, when employed to cure an intermittent. It is to little purpose to give to a grown up person less than an ounce in twenty-four hours, and often double that

quantity. It may be given in doses of two scruples or a drachm each, or about the bulk of a large nutmeg of the electuary every two hours on the day of intermission, and repeated every day for several days, if the fever does not return. After the intermission of three or four periods of the paroxysms, we may diminish the quantity, and give it only every four hours, taking care to give a dose a little before the time of day that the return of the complaint may be most probably expected. If the complaint does not return, the quantity may be, in the space of a week or ten days, still farther diminished, but it must not be left off entirely, for the space of at least six weeks. If the disorder has had several returns, if it be an autumnal season, and the weather rainy, if the fits return every day, or with an interval of two days, or if the patient be weak and emaciated, more caution and attention to the regular administration of the bark will be necessary.

It would be a desirable circumstance, if that kind of the Peruvian Bark, called the *Red Bark*, were to be had genuine; but at present there is reason to think, that it can scarcely be procured. In an obstinate case of an in-

terrestrial, that fell lately under my care, I had an opportunity of trying the effects of the *calamus aromaticus*, which given in combination with the Peruvian bark, in the proportion of one part to two of the bark, stopt the progress of an intermittent that had resisted the bark taken alone. It is proper during a course of the bark to use a moderately liberal diet; but all excess, either in meat or drinks, is carefully to be avoided.

It is an old prejudice that subsists even to the present time, and among some of the medical profession, that intermittent fevers should not be too soon stopt, but suffered to go on through several paroxysms, before the bark should be given. It was thought that several disorders, particularly indurations of the liver, jaundice, mesenteric obstructions, and even rheumatic complaints, were produced in consequence of the bark being, as it was thought, prematurely given. But it now appears, that these complaints were the consequences of the disorder being suffered to continue too long, not of its being too soon stopt, and that the best method of preventing them is to interrupt the course of the fits as early as possible by a steady and resolute use

of the proper remedy. This caution ought to be carefully attended to, and enforced by those who give advice to people in country places, as the prejudices in favour of the fits being suffered to continue, are often very strong.

*Bitter Medicines*, such as the flowers of chamomile, roots of gentian, and centaury, are, in a good measure, similar in their effects to the Peruvian bark. They are, however, less effectual in the cure of intermittents and disorders of a putrid tendency, but better suited to a weak state of the stomach and organs of digestion. A strong infusion of any of the above-mentioned articles, with a little rind of the Seville orange, makes a bitter preparation as efficacious as any, and as pleasant as such a medicine can well be expected to be. A quarter of a pint of this taken twice a day for a week, fortnight, or three weeks, will often be of great service in disorders of the stomach unattended with fever. Infusions of this kind are also convenient vehicles for the administration of some other medicines. I have before mentioned, that saline purgatives may be given to advantage dissolved in an infusion of flowers of chamomile, and the same is true of such diuretic medicines as are of small bulk.

The dulcified spirits of vitriol, and of nitre, may be given in this way, as may salt of tartar when used as a diuretic.

There is likewise another class of stimulant remedies, which seem to act more generally on the system, though they sometimes excite particular secretions. The infusion of *mustard seed* and *horse-radish*, before recommended as a diuretic, is of this kind, and is often given with advantage in cases where the secretions in general are languid and slow. It may be taken with considerable advantage in rheumatic cases of long duration, where the pain is rather tedious and troublesome than acute, and attended with little or no fever. This medicine may be continued a considerable time, several months for instance, with less injury to the health and constitution in general, than might be expected from the long use of substances, whose sensible qualities are so powerful.

*Stimulant applications* of the *external* kind are next to be considered. The principal of these are *Blisters*. The proper use of these, in many instances, is attended with much nicety, and of course not a subject of my

present treatise, which is only to give cautions, and to recommend the use of such remedies as may be applied with safety in such circumstances as are obvious to common understandings, independent of medical knowledge. Nevertheless, there are, I think, many opportunities of their being employed with safety and probability of advantage, in circumstances that require no great medical knowledge to discover. Thus the use of blisters is advisable in all internal pains, whether of the breast, side, or belly, attended with fever. In such cases, after bleeding, a blister, applied as near to the seat of the pain as possible, is a safe, and in general, if put on early after the commencement of the disease, an efficacious remedy; which may, if necessary, be repeated with perfect safety.—In cases, likewise, where cough and pain of the breast, though unattended with much fever, are symptoms, I have seen the best effect from small blisters repeatedly applied to the part where the pain was felt; and believe, if they were oftener tried when these symptoms are but recent, might prevent many complaints of the lungs, which a short neglect renders fatal. I have found it the most easy, as well as effectual method of using this remedy, to apply it at

going to bed, and, if it has risen, to remove it in the morning, and suffer it to heal up, and if necessary to repeat it. This is less troublesome, and I think more effectual, than a perpetual blister.

Blisters are useful in pains of the head accompanying fever, or where any tendency to vertigo or delirium appears. If applied at the first appearance of these symptoms, which are always alarming, they are often of the greatest service, and safe in their application. They are most serviceable in such cases, if applied to the head when fresh shaved; but as that cannot always be done, especially with women, they must be put on between the shoulders. The same remedy is often used in some local inflammations, partly of the external kind. Thus in the inflammation of the eye, or inner part of the ear, blisters behind the ears frequently bring, after other evacuations have been used, great relief; which is likewise the case in violent pains in the cheek and face.

The strangury sometimes follows the application of a blister. This however, though troublesome, is seldom of any serious con-

sideration, as it is mostly relieved by drinking plentifully of any mild warm diluting liquor, as milk and water, infusion of linseed, solution of gum arabic in an infusion of the root of marsh-mallows, and such like. It is thought to conduce to the prevention of the strangury, in those subject to it, to cover the blistering plaster, as far as the flies extend, with a piece of gauze or muslin, and to spread the margin with the gum plaster, to secure its adhesion. By this management, the whole of the flies are taken off when the blister is dressed, which contributes to prevent the absorption of their acrimonious particles, which are thought to be taken into the circulation by being suffered to remain on the raw part. This precaution is of service, but not always quite effectual, and should not be used when a quick operation is required, as it abates the activity of the cantharides. It is customary with some to suffer the blistering plaster to remain on the part twenty-four hours, but I think the time should be measured by the effect; and if a blister be raised in a third part of the time, as is often the case if the plaster be good, there is no occasion to trouble the patient with it for a longer time, which often gives unnecessary pain, and is much more

likely to cause strangury, than if it were removed earlier.

The dressing of blisters is worthy attention. The best of any is a simple plaster of white wax and olive oil, melted together by a very gentle heat, and spread thin on a rather fine linen cloth. This keeps the part from the air, and does not stick to it, or cause any irritation. It is proper, previous to the application of a blister, to examine the surface of the plaster, that it may be sufficiently moist; since, if it be too dry, it will often produce no effect whatsoever. If it seem dry and unpliant, it should be gently warmed before the fire, and moistened, first with a little spirits of wine or brandy, and then with a little olive oil or fresh butter. We must be cautious in practice of applying blisters at all in cases of the putrid kind attended with fever, and where inflammations of the urinary passages are present.

Blisters, however, are not the only forms in which external stimulants may be employed with advantage. It sometime happens, that it may be convenient to employ a remedy of quicker operation, as in violent pains of the head, delirium of fevers, apoplectic or para-

lytic seizures, and the like. In such distressing circumstances, it has been frequently found, that stimulant applications to the lower extremities have been of great service, and proved a safe, as well as an effectual remedy. Mustard-seed bruised, or in fine powder, as the flour of mustard, is the best application. If this be mixed with an equal quantity of stale bread grated down, and made into a rather moist paste with vinegar, it will form a cataplasm of a proper consistence for the purpose here intended. If this be spread about a quarter of an inch thick, on a piece of leather or linen cloth, and applied to the soles of the feet, or in extremities to the whole of the feet, it almost immediately produces a violent burning sensation, and sometimes, though not always, an inflammation of the part; and now and then it raises a blister. The time it should be suffered to remain upon the part must be measured principally by the effects it produces. It should not be removed immediately on the first abatement of the symptoms, nor need it be kept on till they have entirely ceased, as the sensation continues a considerable time after the cataplasm is removed.

In less arduous cases, as in fixed rheumatic

pains of the hip, shoulder, or other parts, a plaster of brine has been applied with advantage, as being less painful than mustard, and less apt to blister than cantharides. In the tooth-ach, and pains of the face, a convenient temporary application may be made, by mixing a little black pepper, ground into powder, with as much brandy, or other spirits, as will make it into a soft paste, which is to be spread on leather, and applied to the face. This produces a considerable sensation of heat, but without any great uneasiness, and seldom blisters, though it is often very efficacious in removing the pain of the part.

The foregoing application is very useful at the first coming on of a sore throat, if laid upon the outside under the chin, and moistened again with spirits as it becomes dry. I never knew it blister, though it is frequently of great service. A mixture of spirits of harts-horn, with olive-oil, put upon flannel, and laid to the throat, is often advised ; but I think it not so effectual as the former.

Medicines that ease pain, and procure rest, are the next to be considered ; these are of several kinds, but opium, by its greater efficacy,

and more convenient exhibition, has superseded, in a great measure, all the others.—Did opiates produce no other effects than those above ascribed to them, it would be unnecessary to give any directions relative to their use, farther than to determine the proper dose; but the operation of this remedy is not so simple, but requires attention to regulate, and, in some instances, to counteract some of its effects. Opium may be safely and properly administered in most cases of violent pain, attended with none, or but little fever or inflammation. Thus it is the principal, and indeed almost the only remedy to be depended on, in those dreadful fits of pain which often attend the passage of a stone or gravel thro' the urinary passages. In such circumstances, opiates may be given with considerable freedom, in proportion to the excess of pain which is necessary to be alleviated, not only for the purpose of procuring ease to the patient, but also to allow the stone to pass, which seldom happens unless the pain and consequent spasm can be abated. Twenty, forty, or sixty drops, or any intermediate quantity of the tincture of opium, or of liquid laudanum, may be taken in twenty-four hours, according to the urgency of the symptoms. Larger doses have been

given, but they are not without hazard, since as the pain is from the nature of the complaint liable, and indeed often does cease suddenly, from the passage of the irritating substance, the opium then is left to exert its full effect, unchecked by the stimulus of the pain, and aided by the disposition to sleep, which naturally comes on after the cessation of great torment. This is said, in some instances, to have produced fatal effects, the sleep proving mortal. On this account it will be prudent, after giving as large a dose of an opiate as can safely be done, to endeavour to allay the pain by other means, as fomentations, warm baths, &c. until the effect of the opiate be gone off a little, and a second dose may be given with safety. If the complaint be attended with vomiting, as those of the nephritic kind frequently are, a larger dose may be ventured on, if we find that what has been before given has been thrown up; but we must not conclude, that the effect of opiates is *quite* lost, even though they should be rejected from the stomach. Their stay is generally sufficient for them to show some signs of their specific qualities. In cases where opiates are proper, and where there is any great nausea or tendency to vomit, it is more

convenient to exhibit this medicine in a solid form: and it is found by experience, that the smaller the bulk of the remedy, the greater is the probability of its being retained upon the stomach. A small pill, therefore, made of a grain of unstrained opium, without any other admixture, may be used in place of thirty drops of tincture of opium, to which it is fully equivalent; and this may, if necessary, be repeated once in twenty-four hours. If the vomiting be so violent as to suffer nothing, however small, to be retained upon the stomach, opium may be conveniently administered in a clyster. Forty drops, or a moderate tea-spoonful, which is generally regarded as equal to a drachm in measure, may be mixed with about half a pint, or less, of broth, gruel, or warm milk, and injected as a clyster, and retained, if possible, several hours.

It is always proper, that the body be kept, if possible, in a rather lax state during the use of opiates. If, therefore, any costiveness be present, it is advisable to inject a clyster of a moderately opening kind, previous to the giving of the opiate, which makes the operation of the latter safe, and less liable to affect

the nervous system. If the use of opiates be necessary to be continued, it is proper to administer occasionally some internal medicines of a mildly purgative kind, as opiates generally render the body costive. The precautions just mentioned are equally applicable to such bilious disorders as are attended with great and often exquisite pain about the pit of the stomach, without fever, and generally without any increase of pulse, and are produced by the gall-stones sticking in the ducts which convey the bile from the liver and the gall-bladder into the intestines. It should, however, be considered, that opium, in both the above-mentioned cases, is only a temporary relief; and though it often assists the passage of the obstructing body, yet is of no service to prevent the return of the disorder, and therefore should be taken only when great pain, and other urgent and distressing symptoms, render its use necessary.

The use of opium is in no instance more strongly manifested, than in the violent purging and vomiting that often comes on towards the latter part of the summer, or during the autumn, and is called the Cholera Morbus. It may not be proper to give opiates

immediately on the access of the disorder, but after we may reasonably suppose the stomach and bowels to be cleared of their proper and natural contents, and little but bile, water, or mucus, passes, it is time to administer opiates, especially if the retching to vomit, distention of the stomach, and griping pains, be violent. In such cases there is no time to be lost, and opiates are often the only resource. They may be given either in a liquid or solid form. The liquid opiate takes effect sooner, but is more liable to be thrown up, on which account we should endeavour to make it as acceptable to the stomach as possible. About a spoonful of warm simple mint-water, or of peppermint, is as likely to make it stay on the stomach as any thing I know, and the smaller the quantity of fluid swallowed with it, provided it be sufficient to disguise the taste, the more proper.

Opium is likewise proper in the simple diarrhoea or purging, that often comes on towards the close of summer. This, though sometimes salutary when moderate, often continues so long as to exhaust the strength and weaken the tone of the stomach and bowels. In such cases it is often necessary to combine the opiate with some cordial astringent, among

which I think cinnamon the best. If an ounce of cinnamon in powder be made into an electuary with any syrup, and the bulk of a small nutmeg taken three times a day with four, five, or six drops of tincture of opium added to each dose, it forms a powerful and safe remedy in autumnal fluxes.

Opiates, judiciously administered, might often prevent many of the bad consequences that follow violent colics, the iliac passion, and inflammation of the bowels. If a sufficient dose of tincture of opium, 20 or 30 drops for example, or, what might perhaps be more proper, a grain of unstrained opium in a pill, were to be given as soon as the pain becomes violent, and before any vomiting has come on, it might allay the pain, and make way for the operation of clysters; and would be preferable, in my opinion, to the exhibition of strong purgatives taken by the mouth, which, if they fail of producing an evacuation downwards, as they often do, cause vomiting, and aggravate all the other bad symptoms. If, however, the pain be violent, and accompanied with heat or thirst, it will be necessary to let blood, which is perfectly compatible with the operation of opium.

This medicine is not only useful on account of its own specific qualities, but also as a corrector of those of other medicines.

It is not uncommon for the Peruvian bark to act as a purgative, which, in some of the most arduous circumstances in which it is given, as in intermittents, and fevers of a putrid tendency, is apt to disappoint its good effects. In such cases a few drops of tincture of opium, added to each dose, generally prevents the bark proving purgative, and of course suffers it to continue in the body long enough to be serviceable. This need not in general be continued long, as after a few doses the bark will usually lose its purgative quality, and may be taken alone.

I shall conclude this head with a caution relative to the use of such remedies; which is, that the taking of them is very apt to insinuate itself, and to become habitual, especially in those who are occasionally subject to painful disorders. If often used, they become almost necessary, as sleep cannot be procured without them. Those, therefore, who are obliged to take opiates occasionally, should make it a point of consequence not to use them except

when they are obviously necessary, and to leave them off as soon as that necessity no longer exists. It may be troublesome at first, but sleep will return in time spontaneously, if the party have but resolution to persevere. The long continuance of opiates requires an increase of the dose, which produces costiveness, indigestion, general weakness, and a tribe of nervous symptoms, very similar to those which are the consequences of dram-drinking, which the taking of opiates in large quantities very much resembles.

I have thus finished what I have to say on the use of the medicines, which are calculated to answer the principal indications of cure. The reader will perceive easily that this extends only to diseases of a certain description, and respects in them only those remedies, the propriety of whose use is obvious to any person of sense and tolerable education, without assistance from professional study or information. I hope I have advanced nothing that is liable to mislead, and I trust that what is advised, will tend to make what future medical operations may be necessary more successful. Physicians often justly lament, and often when it is too late, the imprudent mea-

sures that have been taken previous to their being employed. To obviate this in some measure, is the principal intention of the present essay, which I have put into the present form, as being comprised in smaller compass than if I had treated of the diseases separately, and as I think more easy to be understood.

Some general directions relative to the *treatment of Sick Persons*, which could not so properly be introduced under the several indications, are here added.

*Cleanliness* is a matter of the greatest consequence to the cure both of acute and chronic disorders. Every person who is indisposed, ought to wash the face and hands, and feet occasionally, with, at least, equal regularity as in health. The ease and comfort this affords to sick persons, those especially who labour under acute disorders, can scarcely be imagined, except by those who have experienced it.—Change of linen is a highly necessary article. Every person ill of a fever ought to have clean linen for the head and body every day, and clean sheets every three days, or oftener, if the perspiration be large. Many causeless fears formerly prevailed, and still

subsist, concerning the airing of linen. It is necessary undoubtedly that this should be dry, but this is best insured by its being exposed when perfectly clean to a fire, and dried by that means only. Linen that has been worn, or sheets that have been lain in, with a view to airing them, are unfit for sick persons, as they are in reality fouled and damped by such absurd care. The room itself should be swept daily, and every offensive thing removed as soon as possible, and nothing suffered to remain in the room that is not immediately necessary to the patient. Whatever food or drink he does not consume should be removed immediately after as much as is necessary be taken, and no person suffered to take food in the room except the sick person. It is necessary that the utmost care be taken that the victuals, and whatever besides be prepared for the sick, be dressed with the greatest regard to cleanliness. The stomach, in such cases is always delicate, and it is of the greatest consequence to indulge it in this respect.

*Change of Air and Coolness* are nearly connected with cleanliness, and equally necessary to be attended to. Every person confined to their bed with any feverish complaint, should

have the door and window of the room opened for a quarter of an hour twice, at least, in twenty-four hours. If the weather be very severe, the curtains may be drawn so as to prevent the current of air from blowing on the sick person ; but if the weather be mild or warm, the door and windows should be open through the day and even the night. There cannot be the least necessity why the air should be warmer for a person ill of a fever than for a person in health, but many reasons why we should wish it cooler. To keep a sick person's chamber well aired, (I mean here not by fires, but by opening the doors and windows) contributes not only to the benefit of the sick person, but to the safety of the attendants.—Many fevers, which were at first simply inflammatory, have become by heat, confinement of air, and other improper treatment, putrid and contagious. It is obvious that if the complaint originally be of a putrid tendency, these cautions become doubly necessary.

The proportion of bed-clothes is a circumstance of great moment. These must be measured partly by the age of the patient and nature of the complaint, but principally by the

feeling of the sick person. I have often observed, that much of the restlessness attending fevers, which is so troublesome and fatiguing a symptom, and so exhausting of the strength of the patient, is owing to the quantity of bed-clothes. Too much heat naturally produces a desire to change the heated place for one that is cooler ; but if the body were not uneasily hot, no such impatience would take place.

*Quiet* is another important article. Officious curiosity is apt to make many persons intrude upon sick people, who have very little real concern on their account. This should by all means be discouraged, and no more persons admitted to the chamber of the sick than are necessary to attend him. The admission of others tends only to foul the air, increase the heat, and prevent the rest of the sick.

The proper administration of food is a matter of the utmost concern. At the beginning of inflammatory complaints, provided the patient be young and robust, some abstinence may be proper ; but in the advanced state of all disorders, both acute and chronical, it is necessary to pay great attention to the article of food. As long as any considerable

degree of fever remains, it is proper to use a vegetable diet. Milk boiled with bread, bread and rice puddings, roasted apples, and the like, are all proper; and for drink, toast and water, whey, or (if it be good) small beer: but no stronger liquor, and least of all distilled spirits. A most absurd and unhappy notion still prevails among many of the lower people, that sick persons are in want of something cordial to support their strength, and keep up their spirits; in consequence of which they often, in spite of any directions to the contrary from those who are better qualified to judge, give them some strong fermented liquor, as ale or strong beer, and sometimes rum, brandy, gin, and the like. It is a melancholy reflection, that numbers fall victims to this odious opinion, which, as well as many other instances of impertinent interference with the sick, ought to be discouraged as much as possible.

The mode of giving food to a sick person is worthy regard. It should always be in small quantity, and no more should be brought into the patient's sight than it may be expected he will be able to take at a time. This should be done often in the day, and

even during the night, and without waiting for its being asked for by the sick person, who is often able to take food when he has not spirits to ask for it. It must not, however, be pressed with any importunity, which is more likely to excite disgust than appetite.

The support of the spirits of a person labouring under disease, is as necessary towards his cure as the administration of medicines.— Every person that is ill, should be comforted with hopes of recovery, and cheerful prospects of life. To foretel a person's death in his presence, who is then ill of an acute complaint, has no small influence in verifying the prediction. Even those whose profession leads them to recommend religion to others, should be careful of dwelling too much upon gloomy subjects, and giving people dispiriting ideas of their situation.—Repentance and amendment of life, are, no doubt, in many instances necessary to be advised, but great care must be taken to administer, together with advice, that greatest of all cordials—

*Hope.*

I have before mentioned, that an opinion prevailed among the lower ranks of people,

that bleeding at certain times of the year was a salutary practice, whether any immediate necessity appeared to make it proper or not. The same absurd notion prevails with respect to the taking purgative medicines. It is needless to say more here, than that such habits are extremely improper to be commenced, and should be by all means, if possible, prevented. If, however, they have been begun, we must not precipitately direct them to be omitted, but to diminish the quantity of blood taken, and to omit the purgative, and in time lay them both aside altogether. I am inclined to think, that the almanacks, in which such advice has been for many ages preposterously inserted, have been the principal causes of such absurd notions being carried into practice for so long a course of years. I see it has been of late omitted in some, and hope the others will follow the example.

A prejudice subsists among many people of the lower ranks, against every remedy that does not operate upon them in some sensible manner as an evacuant. They do not measure its good effects by the change it produces upon the health, but by its increasing their natural discharges. This is an unfortunate prepossession,

as several of the most effectual remedies act for the most part without any sensible alteration in the animal system, save the cessation of the disorder. This is the case in general with the Peruvian bark, when given as a cure for the intermittent fever, in which, if medicines of the evacuatory kind were to be joined with the bark, they would, unless very gentle in their operation, frustrate the good effects of the principal remedy. It is proper on this account, whenever medicines of this kind are given, to forewarn those to whom they are administered, that they are not to expect from them any other effect than an abatement of the disorder which they were intended to remedy: a condition sufficient to satisfy any reasonable person.

The common people are too apt to estimate the efficacy of medicines, as they do that of other things, by their pecuniary value and their scarcity. They have no idea that Providence has made the most useful things in medicine, as well as food, cheap and common, and that expense in such articles is oftener necessary to flatter and comply with effeminate delicacy, than to add to the real efficacy of a remedy. The poor who are in hospitals do

not receive, in proportion to their numbers, less relief than the rich in their splendid apartments ; though in the former case nothing be conceded to prejudice, fancy, and caprice ; and in the latter, it makes the most important consideration. It is incumbent, therefore, on all who take the charge of the lower people when sick, to combat this mistaken opinion, and to endeavour, if possible, to convince them, that the best remedies are in many instances the cheapest,

Those who take the charge of sick persons, should be cautious that the same course of medicines be not continued too long a time together. It should be understood, that medicines (at least the greatest part of them) are more calculated to *restore* health than to *preserve* it. We should therefore be careful to recommend, to persons in health, to be contented with the happiness they enjoy in that respect, and not to attempt to improve what cannot be amended, but may easily be impaired. Some ignorant people are possessed with a notion that it is *wholesome*, as it is termed, to drink several infusions of herbs, as of flowers of chamomile, of centaury, and several others. But such trials are not only

unnecessary, but likely to be injurious. The taking of bitters in large quantities, for a long time together, hurts the tone of the stomach, instead of mending it, as was found by fatal experience of those who took the Portland Gout Powder, which destroyed nearly all who tried it. This powder was nothing else than such bitter herbs as are commonly drank in tea, or brewed with malt liquor in the form of purl. What is here said, is not meant to insinuate that bitters *properly* and *moderately* used, are not very useful remedies. It is the excess only that is censured.

Another reason why we should be upon our guard against continuing the use of the same medicines for a long time is, that it is apt to introduce that most destructive of all habits, *Dram-drinking*. Many of the tinctures recommended in this way are little else than drams concealed under a medicinal disguise, and as such should be with equal caution avoided, as far as respects their becoming habitual. I have more than once seen a habit of this odious kind introduced among women, particularly by these means. It is not so likely to happen to the lower ranks, as to those

who employ them, for whom this caution is principally meant.

The last piece of advice I shall offer respects **QUACKERY.**

Perhaps there is nothing disgraces the police of this country more, than the numerous impositions of this kind that are daily advertised. Scarcely any one of them has not only a greater certainty of success ascribed to it, but is alleged to be infallible in a greater variety of disorders than are curable by all the articles of the *Materia Medica* taken collectively. Some of these boasted remedies are merely frivolous and inert, but others are violent and dangerous in their operation, and highly improper to be trusted to such persons as those who are thus rashly encouraged to take them in an indiscriminate manner. A solution of arsenic is said to have been the basis of a late specific for fevers, and I am well informed has in several instances destroyed the patient. These instances however, are carefully concealed, whilst every escape is carefully recited as a cure, owing to the remedy so given.

No piece of humanity would be greater

than to preserve the ignorant and uneducated of the lower ranks from sacrificing their health and money to unfeeling fraud and interested knavery.

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## ESSAY XXV.

*On the Use of Salt as a principal Condiment in increasing the Appetite of Graminivorous Animals.*

HITHERTO the greatest part of mankind seem to forget, that mere animals have the sense of tasting in as great perfection as man; and are disposed to indulge their appetite for sensual gratifications, without any restraint, wherever circumstances put it in their power. The uses that may be made by man, for his own emolument, of this natural propensity of animals, are very obvious, when adverted to. Yet I know no case in which the general attention of men seems to have been strongly

turned to that point, unless it be in respect to the fattening of calves ; for I have met with few persons who have had an extensive practice in this department, who are not sensible that the profit is in proportion to the quantity of milk that the creatures can be induced voluntary to take in a given time. This solitary fact is known by thousands, who never once think of extending it to any other case of animal existence. But there are not wanting a few persons, who, in consequence of accurate observation, have discovered the vast importance of studying with care the taste of the creatures they feed, that they may not only furnish them with the kinds of food they like best, but also to vary these from time to time, and to give them exactly in the quantities, and in the way that they find will induce the creatures to eat the most ; having the full experience, that the profit to be drawn from feeding beasts is always proportioned to the increased quantity of food they can get each individual *coaxed* to consume in a given time. In this branch of rural economics, I have met with no person who has made greater progress than a plain practical farmer at Hope, in the neighbourhood of Manchester, who spares no trouble nor expense in procuring such kinds

of food and condiments as he finds best calculated to induce his cows to consume, in a given time, the greatest quantity of food possible. The consequence is, that this man makes much money, where his neighbours, who are not in the secret, and more niggard in their outlay than he is, sustain a loss. Among other condiments, this man has discovered, that *pure* water stands pretty high in the scale; on which account his beasts are never suffered, far less obliged, to taste a drop of water that has ever been sullied by any animal setting a foot into it. With this view, they are always served with running water, which is, for their convenience, received into a long wooden trough, through which it passes while they are drinking. Such poor beasts as are compelled, through necessity, to drink out of those muddy stagnant pools, in which other cattle have waded for days together to cool themselves in hot weather, which are fully impregnated with their dung and urine, feel the inconvenience of this nauseating draught; and the farmer, of course, suffers an abatement of his profit to an astonishing degree. Astonishing to him, it may be justly called; for though he feels the effect, he seems to be ignorant of the cause, and there-

fore suffers it to exist, without an attempt to remove it; as every attentive person must have observed in many thousand cases.

There can be little reason to doubt, that animals which can be induced voluntarily to take an extra quantity of food in a given time, will be quickly fattened by that practice; but we would scarcely be inclined to suspect, that the same effect would be the result where the animals are compelled involuntarily to take a much greater quantity of food than they ever would do, if left entirely to themselves, were we not in possession of facts which undeniably prove that this is certainly the case. The practice of *cramming* fowls, as it is generally called, establishes this point beyond a doubt.

The following method of fattening geese, in Languedoc, in France, while it proves the position here stated, deserves to be generally known, as it will give some hints that may be useful in fattening other animals.

After the bird has got into *full flesh*, (i.e. by being well kept upon green food,) it is necessary not to delay the fattening of them too long, lest you lose the season entirely. About

the end of December they enter into rut, *after which time they will not fatten at all*. As soon as the frost has set in, (usually towards the end of November,) they are shut up, to the number of *ten or twelve* (never more) in a dark still place, where they can never see light, nor hear the cries of those which are kept for laying. They remain in that prison till they have attained the greatest degree of fatness, and are ready for killing: that moment must be seized, otherwise they would very soon turn lean, and at last die.

There are two ways of fattening of them.— The *first* is, by giving them a trough filled with grain, which they call *sarde*, so that they may eat whenever they please. [I do not know what kind of grain is denoted by the word *sarde*. Perhaps it may be buckwheat. It does not seem, from what follows, that the effect of the operation called *malting on grain*, intended to feed animals, is there known.] The geese fattened on this grain are very delicate. Others put into the trough grains of maize boiled in water. They take care to give them *plenty* of that food, and *to keep the coop clean*. At the end of two or three weeks, the geese are all fully fattened.

They are then taken out of the coop, and allowed to go at large into the water for twenty-four hours. Without that precaution, their flesh would have a disagreeable flavour.

The above may be called the natural method of fattening, by *enticing* them to eat food enough of their own accord. The *second* may be called the *artificial* method, and is as follows :

The geese are put up in the same manner as before, and are *crammed* twice a day, by putting into their craw, by means of a tinned tube, as much as it will hold, of maize boiled in water. The tube is used, because the bill of the goose being furnished with teeth, the person who should attempt to perform that operation by hand, would soon have it scratched and torn to pieces. By this means, the geese acquire *a prodigious fatness*, so that *a pair sometimes weigh from fifty to sixty pounds*. Their *liver* weighs from one pound to a pound and a half,—is white and delicate;—but has a slight bitterness to the taste, which the liver of a duck has not. The *hearts* are large, like a small apple, and when dressed on the gridiron, they are excellent

eating. The feet are boiled, after which they are fried the same as the tongue.

Ducks are fattened in the same place, as under :

When the ducks are pretty fat by the usual modes of feeding, they are shut up in a dark place. Every morning and evening, a servant puts their wings across, and placing them between his knees, opens their bill with his left hand, and with his right fills the craw with boiled maize : they sometimes die suffocated ; but they are not a bit the worse for it, provided care is taken to bleed them directly. The unfortunate animals pass there fifteen days in a state of oppression and suffocation, in consequence of *their liver* growing large, which keeps them always panting, and almost without breathing. *When the tail of the duck spreads out like a fan*, they know that it is fat enough ; they are then turned out to bathe in the water, after which they are killed.

I have opened two ducks, of which the one had not, and the other had been crammed. The first had a liver of the natural size, the

skin equally thick in all places, and the lungs perfectly sound. That which had been crammed, had *an enormous liver*, which, covering all the lower part of the belly, extended as far as the anus. The lungs were small, and loaded with blood. The skin of the belly, which covered the liver, was of the thickness of a shilling. When the ducks thus crammed, as well as the geese, have been plucked, they seem balls of fat, and none of their members are discernible.

There are some inferences, not a little curious, that may be drawn from these facts, in regard to the fattening of other animals. Not only does it confirm the general position assumed above, that the more food an animal can be made to take, in a given time, the quicker it will be fattened: but this rule seems to hold, when it is given even in a *hurtful* quantity, beyond what the animal would naturally have taken; and farther, that by certain modes of feeding, when well understood, the size of particular parts of the body can be augmented at pleasure, far beyond their natural proportions. Could the quantity of tallow in quadrupeds be augmented nearly in proportion to the liver, in this case, it is

evident the profit to the owner would be greatly augmented.

There is no substance yet known which is so much relished by the whole order of *graminiverous* animals, as common salt. The wild creatures of the desert are so fond of it, that wherever they discover a bank of earth impregnated with a small proportion of salt, they come to it ever after regularly to lick the saline earth, as they would to a pool of water for drink, were there none other near; so that when a hunter in America discovers such a *lick*, as such places are there called, he reckons himself sure of obtaining plenty of game, by lying in wait near it, and shooting them as they approach it, until the whole beasts that have discovered it are killed.

It is also admitted by all those who have tried the experiment, that salt, given along with the food of domestic animals, [except fowls, to which salt is a certain poison,] tends very much to promote their health and accelerate their feeding; and although some persons, who have been at a loss to account for the manner in which this stimulant could act as a nutritious substance, have affected to

disregard this fact, yet no one has been able to bring the slightest show of evidence to invalidate the strong proofs that have been adduced in support of it; though, unfortunately for this country, few experiments of this kind have been tried in it. In fact, we have no reason to suppose that salt acts in the smallest degree, as a nutritious substance, or, *of itself*, tends to fatten any animal; but that merely, by acting as a condiment, it whets the appetite, and gives the creature to which it is properly administered, a strong relish for its proper food, so as to induce it to eat *in a given time* a greater quantity than it would have done, and thus greatly to augment, as has been above explained, its feeding quality beyond what it otherwise could have had. In this way, it is not perhaps an extravagant position to say, that by a proper use of common salt, the same quantity of forage might, on many occasions, be made to go twice as far as it could have gone in feeding animals, had the salt been withheld from them. If so, (and let those who are inclined to withhold their assent to this position, prove, by a set of experiments fairly conducted, that it is erroneous,) till then, the unvarying testimony of the few who have tried it, confirming the

position, ought to be relied on. If so, then, (I still say,) we have here laid open to our view an easy mode of augmenting the produce of our fields to an amazing extent : for, if the same quantity of forage can be made to go, not twice as far, but *one-twentieth* part only farther than it now does, it would be the same thing as adding *one-twentieth* part to the aggregate produce of meat for beasts throughout the whole kingdom. But, according to the estimate of the President of the Board of Agriculture, there are upwards of fifty millions of acres of *cultivated* land in this island ; the value of that forage produced by which, cannot, on an average, be rated so low as twenty shillings *per acre* ; but even at that low rate, the addition of *one-twentieth* would amount to 2,550,000*l.* *per annum* ; a sum so great, that when viewed in the aggregate, it is difficult to bring the mind to believe that such an improvement is actually practicable ; yet, when the particulars are considered in detail, it seems to be impossible not to admit that the amount of the improvement must be greatly above what is here stated.

This improvement, however *immense* as it must appear to be, in whatever way it can be

viewed, is entirely prevented from taking place in this island, by reason of the salt laws: for while these shall be continued on the footing they now stand, it is vain to think ever to induce farmers even to try the experiments that are necessary for elucidating the facts here wanted: and other persons are, for obvious reasons, incapable of making the experiments; nor, if they could make them with the utmost accuracy, could they ever convince farmers in general, while the duties shall be allowed to continue as they now are, so far as to induce them to make a copious use of salt for their beasts in their general practice. Considered under this point of view, as well as many others, the duty on salt must be accounted one of the most impolitic taxes that ever was imposed in any country; as it tends to retard the prosperity of the nation in a thousand ways, to an amount that no person, who has not considered the subject with the same attention I have done, could ever believe to be possible.—Better were it for the inhabitants of this country to pay an hundred times the amount of the free produce of the duties on salt, if levied in any one of a variety of ways that might easily be suggested, which do not bind up the hands of industry as this

does. But so long as party cabals shall occupy the minds of the leading men in the legislative and executive departments of government, to the exclusion of every object from their serious thoughts, that cannot be immediately connected with them, it is in vain to think that observations which tend to promote merely useful measures, which might perhaps affect the interest, and tend to disgust some powerful supporters of either party, or their adherents, will ever command the attention of either party.

## ESSAY XXVI.

*On Farm-Yard Compost.*

AS a farm, in most situations, chiefly depends on the above for its improvement, no attention should be spared to make the heap as large and as rich as possible. The management of most common farmers is, in this respect, exceedingly deficient; they are ready to sell their hay, straw, stubble, &c. rather than consume them in making dung, and very rarely pay any attention to the preservation of the urine and drainings of their dunghills.

The first of these articles is so important, that without a very determined attention to it, no farm can ever be brought into very high order. All the ensuing management depends upon the quantity of straw and stubble, or litter, being large: but if the farmer sells his straw, how is he to see a great dunghill. The farm-yard manure depends on the consumption of hay and straw; just in proportion

as either is sold, the dunghill must decline ; and sorry I am to observe, that it is too common a practice among farmers to be ready to sell both. The rule, however, admits of exceptions; for near very large towns, hay and straw for littering horses will sell for such high prices, that if the farmer's waggon or cart brings him back a load of rich manure, it may be more advantageous to sell than to consume. Profit is the great object, and we must never carry any rules so far as to lessen it ; but the common error is doing it too universally, and being tempted with too low prices. To name a price under which a farmer should never sell, is not easy to be done, as it must necessarily be regulated by various circumstances. There are many hay farmers near London that entirely depend on selling, whatever may happen to be the price : no system of cattle is prepared on such farms to make a profitable consumption of hay, which can only arise from other connected articles. But where such cases do not immediately mark exceptions, I think I may safely say, that a ton of hay, in commonly improved countries, ought never to be sold dry in the winter for less than 50s. nor a ton of straw for less than 30s. with a proviso that they should go at no

price without a load of rich manure being brought back. There certainly are farmers who might say, *How can I make 50s. by eating my hay at home?* All I reply is, that if you cannot do it, you are not in a good cattle system, or you give it lavishly or improperly; and that he who makes a point of doing it, will, in the long run, find his annual dunghill so large, and his fields consequently so improved, that he will assuredly find his account amply in it. It is only by means of such attentions, that cultivators have made the surprising quantities we have heard of.

At the most leisure season, before the time of confining his cattle to fodder, so much marl, turf, dry mud, loam, &c. should be carted into the farm-yard as will cover the whole about twelve inches deep; and if there are many stables, hog-houses, bullock, or cow-stalls, that are cleaned into it, to spread such earth thicker in those places. Those who have the fortunate opportunity of using bog peat, from the vicinity of a bog or boggy bottom, should not neglect it: such stuff is a vegetable dunghill. Only drenched in water when dry, and carted plentifully into a farm-yard, and littered upon, and impregnated

with animal manure, it becomes a most easy and valuable means of adding nobly to the quantity of the farm-yard compost.

Before the farmer begins to fodder, which will be probably some time in November, let him litter the whole yard well with either stubble, fern, or leaves. For this purpose I suppose all his wheat-stubbles mown and chopped, and stacked in or very near the yards. If he is near a warren, heath, or common, he may probably be able to procure fern cheap, that is, at the price of eight or ten shillings a waggon load, in bulk equal to a ton and half of dry hay, wherever such opportunities exist, they ought never to be neglected. In the duchy of Mecklenburgh they are wise enough to know the value of this plant for litter, and reckon the dung that is made of it fatter than that of straw.

If his neighbours will sell their stubble at 12s. to 15s. a waggon load delivered in, he ought to provide a large quantity.

Fern, in burning, yields more alkaline salts than any other vegetable, which is proof sufficient how valuable the dung must be; but

care must be taken to rot it well, which is more difficult than to rot straw.

No money which a farmer can expend, is better laid out than in the purchase of litter of any kind ; for his cattle do not only lie dry, warm, and bedded; but the quantity of manure he raises is very large, and cheaper than in any otherway of buying it.

The article of *leaves*, depends on his situation. If he is in a woodland, where the trees are thick and spreading, they are to be raked into heaps, and carted to the farm-yard, at a very moderate expense ; they make excellent litter, and very good dung. Mr. Bevor, of Hethel, has them raked and loaded at 6d. a load. If he has any marshes in his neighbourhood, that afford a good swarth of rushes, coarse grafs, flags, &c. &c. he should not neglect to lay in good store of them for the same use ; and if he has the power of cutting the aquatics that rise under water in lakes or meres, or flooded grounds, he may do it by jointed scythes, and rake them into boats. I have rowed through acres of water, in Ireland, in Loch Erne, so full of these, that

the quantity of litter they would yield is prodigious.

These steps being taken, the farmer is well prepared to meet the winter, and to turn it greatly to his advantage; but, in order to do this, he must adopt that husbandry which this climate points out as necessary, but which those commonly esteemed more happy are exempted from, and consequently tempt farmers to neglect this necessary business of making dung. The management I mean, is the strict confinement of his cattle during winter. Some curious cattle-masters tie them up in stalls; I do not require it; but it is essential that they are confined to the yard, and on no account suffered to roam about any pastures, which is a practice too common. If all the cattle of a farm are absolutely confined to the yard, the lean stock to straw, and the rest to straw and turnips, &c. or to hay, the compost of marl, litter, and waste straw, will have the necessary quantity of animal manure amongst it to ferment, rot, and turn to rich manure; whereas if the cattle do not live entirely in the farm-yard, the heap may be large, but of little value; a difference I have had repeated occasion not only to observe,

but to experience in taking dung at a valuation from *quantity*, when the quality (owing to this circumstance) was of little worth. The benefit to the cattle of wandering is much less than is supposed by some; and the mischief to the grass lands, except on the lightest soils, very great.

In this system there must always be a pond's mouth in every yard.

The common error, to be seen in the management of half the yards in the kingdom, is suffering the drainings to run to waste. Rain and snow will, in spite of any management, sometimes overflow; but in general the whole may be under command. The best method is to sink a well about five feet deep in the lowest corner of the yard, to fix a pump in it, and to raise a small stage whereon to stand and work it; a trough will then convey the water to a large heap of marl, chalk, turf, loam, &c. and daily pumping over it will make it of little less value than a heap of dung of the same size. The whole expense of what is necessary for this will be under four pounds; and that of pumping is too trifling to think of. The dung should never be suffered

to remain under water, however rich it may be ; as putrefaction is in that case stopped.

At the end of the foddering season, the farmer is to turn over and mix very well together the compost which his winter management has given him. This is necessary, that the dung and earth may be well incorporated.

Thus the dung is ready for turnips or cabbages ; if kept longer for beans, to be carried on in autumn, or for potatoes, in the following spring, in which case it must, on wet land, be carted in a frost. And here results the convenience of having a variety of farm-yards ; that is, one on each side of a barn ; for if the dung is not carted for turnips or cabbages, it must be moved to a heap, as the foddering of the ensuing winter will begin before it can be taken for the other crops. This carting to form a heap is equivalent to a stirring, and I would not have the heap touched after the first mixing together of the marl and the layer, which has accumulated upon it. Many persons turn over their dunghills frequently, in order that they may rot the sooner ; but I have often observed that no dung becomes so

thoroughly and equally converted into a mucilaginous mass—into black butter as the farmers call it—as that which never was stirred at all. By moving, the dung is made to lie loose and hollow ; every fresh fermentation that is excited in that state volatilizes the oil and alkaline salt, and carries it off to the atmosphere : hence we see that a dunghill often stirred or moved, though black and rotten, is by far drier than one which has remained untouched ; and it is the fat, oily, wet rottenness that is valuable, that is mucilaginous. The longer you keep, and the oftener you mix your dung, the drier it becomes ; till at last it has the appearance of black snuff, and might be sown by hand. Hence, therefore, to avoid too much stirring and moving, (which by the way is very expensive also,) I would let it rest in the farm-yard till the land is ready it is designed for, and fodder in another yard. If the buildings and conveniences will not allow this, then in the spring, as soon as the foddering is over, I would, instead of turning over, cart it at once out of the yard into a heap, taking care to mix the marl with the litter as well as possible in filling the carts ; and making the heap in the field where it is to be used, leave

it untouched ; in which way the dung has but one stirring also. The heap should not be above four feet thick, and not carted on to ; and if it is put in a shady place, under thick spreading trees, so much the better.

Here you will permit me to reprobate a very common and mischievous practice ; it is that of keeping hogs in the yard, who, for ever burying themselves in the straw, disturb its fermentation so much, that the putrefaction so necessary to bring it to a mucilaginous state can never go on as it ought. These animals are not content with the fresh straw just thrown out of the barn, but dig into and disturb the mass that is trodden down, and which ought to rest, in order to ferment. One can scarcely go into a farm-yard without observing this ill-management ; the food thus procured for the hogs is of no value comparable to the mischief they do ; at the end of the foddering season, the litter of the yard is in so uncorrupted a state, that it must be carted on a fresh heap in order to rot ; whereas a dunghill made in any place where the hogs cannot get at it, will often be ready to carry on the land. I have heard the practice defended, as there is no folly but will meet its

patron; but let me ask these people, would they have the mass of litter in the yard ferment and putrefy, or would they not? And does grubbing into, and disturbing it daily, retard or accelerate the fermentation?

If a yard was kept warm by covering it with a roof to keep out rain and frost, admitting air around it, the litter would putrefy the sooner. How ill-judged, therefore, to let the cold air, frost, and snow, into the mass itself, by the holes these grubbing animals are constantly making! The hogs should be confined to their own small yard.

Respecting the quantity to be used per acre, it depends on three circumstances. The richness of the compost—the soil—and the crop.—If many beasts or hogs were fattened in the winter, it will be much richer than if made by only lean cattle, when more must be used.—If the soil is very poor, it will demand the more; and potatoes or cabbages will require a larger manuring than other crops. However, in a general way, forty tons may be reckoned a proper manuring, if the compost is not very rich; if it is, thirty.

A very different system from this has been practised and recommended by some persons; which is, to neglect littering altogether—to keep all cattle tied up—and to make them eat all the straw. This is done by means of particular standings or floors, that have a step immediately beyond their hind-feet; so that neither their dung nor urine falls on the part where they lie, in which manner mere sweeping keeps them clean. This may be the most profitable in certain circumstances, particularly where straw cannot be purchased, and on farms that contain much grass and but little tillage.

Before I quit this subject of managing the farm-yard dung, I shall mention a speculation which I believe I shall put in practice, as soon as it suits my convenience. It is to cover the entire farm-yard with a slight roof of feather-edged boards; the expense is not considerable. I have little doubt of its answering greatly. Very heavy rains and snows that float the yard by accident are bad enough, but not so much to be guarded against as the sun, and especially upon the system of soiling in the summer, or a part of it, all the cattle on the winter's dung. No man that

has not tried it can easily conceive the difference between the dung that is made under cover, and that which is exposed to all weathers. The superiority is indeed so great, that I believe one load to which neither the sun nor rain can come, is worth two exposed to both. It rots much better and quicker also.

I should apprehend the yard cattle also would be in better condition, when covered from the weather, than when exposed to beating rains; but the whole side to the south should be open about nine feet high, in order that they should have plenty of air.

## ESSAY XXVII.

*On the Size of Farms.*

ALL considerations on the size of farms ought to be in reference to two principal objects. First, the gross produce of the earth; and, secondly, the neat produce of it: by which neat produce I mean the portion of it, which finds the way to market, and supports the part of the population of a country not immediately concerned in its cultivation. The subject admits of collateral views, such as the revenue of the Prince, and Population: but as they properly flow, by the application of just principles, from the decision of those two chief circumstances, they do not demand a particular attention.

If there are men who would wish to have small farms, whether the product of the earth was great or little, and who do not esteem any circumstance equal to a minute division, I leave such to their systematical visions—they

by no means merit attention. The argument generally advanced is, that the earth is better cultivated by little farmers than by great ones.

It would be a very curious disquisition to inquire which of these products the *gross*, or the *neat*, ought to be the object of a legislature in the regulations of landed property: To enter fully into this question would carry me too far: It is sufficient to observe, that those are the most flourishing countries, where the neat produce is the greatest, because the existence of it as a superlucration of husbandry provides in the more ample manner for the classes unconnected with agriculture, viz. the inhabitants of towns, manufacturers, soldiers, seamen, &c. And as the wealth, power, and prosperity of a modern State depend exceedingly on these classes, they necessarily give a superiority in this view to the *neat*, rather than to the *gross* produce. And as a confirmation that this ought really to be the principal concern, we may recur to the case of an extreme division of the soil, in which every family might have just enough land to support itself by means of a very operose culture, and consequently could spare nothing for market,

The families might live comfortably (provided the surplus of their population emigrated)—the soil might be admirably cultivated—the country might be very populous, but there could be neither cities, towns, army, navy, nor manufacturers. Such a nation of little farmers would be the prey of the first invader, for they must stick close to their fields or starve. This case shows, that cultivation and population are to be considered only in connection with the political interests of the community. Cultivation is not essential to the happiness of the individual: a Tartar family living on their mare's milk, may be as happy without tillage, as a European peasant with it. Hence, therefore, no useful conclusion can be drawn from maxims that lay down the measure of subsistence as the measure of population; because population ought never to be considered that is not applicable to the prosperity and defence of the community: And I have already supposed a case in which a country might be exceedingly populous and yet very weak.

And here I must stray for a moment from the immediate line of my argument, to obviate a very common error, which I meet with

every day both in books and conversation ; and that is, the notion that great national strength results from breeding numbers of men in little farms. This I take to be erroneous, because I have viewed great tracts of country with close attention ; and have reason to believe, that young men bred up to country labour, sobriety, and industry, rarely, or never enlist ; nor can the State get at them but by tyrannical means, such as enrolling them in regiments by force. I have observed in England, that a peasant (unless a profligate fellow) will not enter into the army if he has not been rendered idle by serving in the militia. A very general observation tells me, that our late wars have been entirely supported by the inhabitants of towns, chiefly manufacturing places. A war gives a check to fabrics ; hands are thrown out of employment, or wages are sunk ; then workmen enlist fast : and thus it is that we hear of such incredible numbers supplied by single towns, such as Birmingham, Manchester, &c. Nothing so idle, therefore, as to tell us of the superior robustness, and hardiness of countrymen : It is nothing to the purpose, without tyrannical operations, to take that vigour from the innocence of its own fields, and imbue those

hands in blood, that were educated for the plough. I am not, however, so ready to admit the superiority in modern war, undoubted as it was before the invention of artillery. The scum of towns, the outcasts of cities, have in many regiments, equalled whatever could be performed by rustics. An army is not always employed in intrenching. A sturdy peasant may not be moulded into an automaton, that is to perform rapid evolutions as easily as the more pliable body of a manufacturer. But whether this is just or not, the fact remains the same, that it is the towns, and not the fields, that recruit our armies. The conclusion I draw, is the necessity of the policy common in Europe, to leave the size of farms free, that the private interest of proprietors may unite with that of the State in raising from the land as great a neat produce as possible ; or, in other words, supply as many, and as great towns, and as flourishing manufactures, as the nature of the territory will permit.

Thus far I have virtually allowed, that an extreme division of the soil is well calculated to raise the greatest gross produce ; because I may grant this to my opponents without the

least injury to my general argument. But I am perfectly persuaded that the fact is otherwise, and that large farms are much superior to small ones in this as well as in every other respect. In fact, we have throughout England no tracts of country (not one to my knowledge) divided generally into small farms, and yet well cultivated. By *small* I mean under one hundred acres. I am well acquainted with vast numbers of them, and scarcely know a single one that is well cultivated. Some there must, of course be, from 70 to 100, that may be tolerably managed on good land: but I contend, that even such will be much inferior in the culture to larger ones; and that for every well-cultivated farm, of that size to which I am referred, I will show ten admirably managed of 5, or 600 acres, or more. And as to much smaller ones, such as 10, and 20, and 30 acres, which, according to the arguments of so many writers, are the best of all, they are found in England to be very generally the residence of poverty and misery; wretchedly cultivated. Not that I would prohibit them. Perfect freedom is all I contend for. If they are a spur to the industry of labourers, to make them sober and saving in order to become the occupiers of such, they are advan-

tageous, but by no means for the products that will be gained from them.

I have found from a close inspection, that the number of horses in a country thus divided, is treble and quadruple the number found upon large farms; one very evident reason for the poverty of their cultivators. There was a farm in my parish (at present my property) of only 16 acres of land, and yet the man kept two horses: no wonder he failed, notwithstanding the most intense industry. There is another remaining of 28 acres, on which there are three horses kept. A contiguous one of 350 acres has only 10 upon it. Those who are advocates for little farms, in order that pigs and poultry may be plentiful, forget the swarms of horses that eat what would feed myriads of pigs and chickens.

The point of taxation to raise the necessary revenue of the State, depends like so many other circumstances on the *neat*, not on the *gross* produce. If a country was divided into very small farms in property, the owners living entirely within themselves, fed by their corn, or their butter and cheese, the wool of a few sheep converted into clothing, and

patch of flax into linen by the female part of the family; such a farmer would want to go to market for nothing but the very trifling reparation of the irons of his instruments, and for salt, both which might be gained by a little barter. Such a man's farm might be cultivated like a garden, and the proportional population great, but what says the sovereign to such a system? Such a man can pay no taxes without the greatest distress.

But what are we to say to poor soils and countries that want improvement? Can these be managed by little farmers? We have vast tracts of land in England that can be cultivated to no purpose whatever without a fold. Divide a large farm so that a flock of sheep cannot be kept, and after absenting yourself some years, return to view your improvement. But why do I waste time in reasoning upon points that are self-evident. The same argument is equally applicable to soils that require inclosing, marling, draining, laying down to grasses as a preparation for corn; and, in a word, any expensive improvement.

That little farms may be had upon soils naturally fertile, and that want no other improve-

ment than the common routine of the year, is a fact; but even upon these in England the superiority of cultivation and product is all on the side of large farms. We are told, that in Flanders the case is otherwise. I have not seen the country, and therefore cannot contradict the fact: but it appears, from M. Mann's memoir, that they are commonly in property, which certainly makes a vast difference: unite that circumstance with the richest soil that is to be met with in Europe, and you certainly describe the case in which little farms will be attended with the greatest advantages they are capable of. There are numbers of such in Switzerland, and they are thought favourably of for the same reason.

Such are my reasons for thinking that the *gross* produce of the earth is larger from a country divided into greater farms than if it were in small ones: but all these reasons may be of no avail, and the fact quite contrary, yet the advocates for the latter would find themselves not at all nearer to their mark; for as I set out with saying it is not the *gross*, but the **NEAT** produce in the markets that must decide the general question.

That this is greatest from large farms, no man of the least attention to country business can entertain a doubt. In the first place, the agriculture of them is incomparably better than upon small ones: the permanent improvements which bad soils *may* require, are only to be found upon them. And when a large gross produce is raised, it is not devoured as on little farms, by a multiplicity of useless horses, but as much goes *neat* to market as is possible. Every sort of work is done cheaper and better, by being distributed to hands accustomed to perform it. The ingenious writer, Dr. Smith, has shown, that one reason why manufacturing labour is better performed than that of agriculture, is the *division* it undergoes. A pin is well and cheaply made, because every article in its fabric is a distinct trade. Agriculture will not admit of this, for men cannot be employed their whole lives in sowing, others in ploughing, others in hedging, others in hoeing, and so on; but the nearer we approach to this the better, which can only be on a large farm. In a small one, the same man is shepherd, hogherd, cowherd, ploughman, and sower: he goes about ten different sorts of labour and attention in the same day, and

consequently acquires no habitual skill peculiarly in any:—and this affects not only the manner in which work is done, but the quantity and cheapness.

The amount of the great farmers improvements, and the superiority of his cultivation, make him also superior in the quantity of population he supports, at the same time that he sends a greater neat produce to market. This I have found to be the case by comparing the population of different farms in above 100,000 acres of country: but it is not a circumstance on which I rest any merit, because the fewer hands employed on a farm, the more may be employed in manufactures, &c. This question properly reduces itself to the simple inquiry, *are machines advantageous in agriculture?* We know the clamours that ill-informed people have in every age raised against them in manufactures, and all the enlightened world is now convinced of the folly and futility of those complaints: But in regard to agriculture, it seems, from the panegyrics which are from time to time given of the spade as the best instrument of culture, that the ideas of mankind are not equally cleared. A plough tills the earth ten times

as cheap as the spade, and consequently, compared with that instrument, throws ten men out of employment for one it keeps in it. Does it depopulate by this?—Very far from it. It enables those ten men to be much better employed in manufactures or commerce. The reasoning extends to all new machines which have the same effect of throwing men out of work. The fewer men required to cultivate the earth, the more numerous may be those classes unconnected with agriculture, because the greater is the *neat* produce which goes to market. Every mode, according to this reasoning, of simplifying the operations of agriculture by means of large occupations, is perfectly harmless in respect to population; for while the soil is well cultivated, the produce will find the way to market, and will certainly be consumed; and you can do no more than consume it, if you had a farmer's family in every field. If it is said, that the country may be very thinly peopled and the neat produce exported. I reply, that that will depend on the state of manufactures, commerce, &c. and on the increase or decrease of population: The home demand will always be first supplied, but when it is supplied, the surplus *ought* to

be exported, or prices will be low, which is the greatest obstacle to the industry and prosperity of a European society that can be imagined. England has for some years lost her corn export, but she has in those years experienced so great an increase of population as fully to account for that loss.

It certainly is owing to combinations like these, that the closest observers have been of opinion, that grass land was more advantageous to population than arable; always meaning, I apprehend, (though they do not thus qualify the observation) that sort of population from which is principally derived the force and strength of a State. There is, beyond all doubt, thus much truth in it; that it is always right to have those lands in grass which are better adapted to it than to corn, without admitting any idea of injuring the national population by such an application of the soil.

Having thus examined the two questions of gross and neat produce, let me add an observation not immediately connected with either.

No restrictions whatever should be thrown on the size of farms, because they ought to be of all sizes in order to find employment for all sorts of capitals. There ought to be farms of 20 or 30 acres, that labourers may have an encouragement to save and be industrious. If a farmer has saved 2 or 300*l*: he ought to be able to meet with a farm proper for that sum to place his son in; if a man has 10 or 20,000 pounds in his pocket and willing to invest it in agriculture, he ought, for many obvious reasons, to be able to do it. Hence there should be an entire and universal liberty in the police of farms. The private interest of landlords will prevent an excess either way: for if little farms become very scarce, they will let so much better than larger ones, that gentlemen will divide their farms; and, in order to gain them farmers, will adapt their management to fewer buildings than the enormity of them, common in many parts of the kingdom. On the contrary, if small farms are so numerous, and consequently let so low that they will not pay for repairs, then they will be thrown together: and these vibrations moved by the never-failing spring of private interest, will preserve that varying level which ought always to take place in these affairs.

Another reason why no limitation should be placed to the size of farms, is the merit which great farmers undoubtedly have of introducing and extending such modes of culture as gradually improve the national agriculture. This ought to be the great object of gentlemen's farming: and when they are successful in such introductions, who are the farmers that follow them, and make beneficial practices general?—Little ones?—Never. If a country consisted of no other, it could never be improved at all. I am well acquainted with the progress and present state of English agriculture in all parts of the kingdom; and can venture to assert, that we owe the extension of every great and beneficial practice, such as marling—turnips hoed—carrots—clover—sainfoin—watering meadows—drilling, and horse-hoeing beans—dibbling pease on layers, &c. &c. all to great farmers; and whatever further improvements we may look for, must be gained by the same means.

But here I must observe, that of all the divisions of landed property, that which is most to be approved, is, small and middling proprietors occupying their own estates, but not being gentlemen. By having no rent to

pay, they are enabled to farm their lands incomparably better than the common race of little farmers; and by the property of their improvements, descending with the land to their posterity, they are perpetually animated to every exertion of good husbandry of which the soil is capable. But this remark does not extend to very little spots, such as must be cultivated with the spade, being much too small for any national advantage, whether owned by the farmer or not. I know many estates in the maritime part of Suffolk, of 2, 3, or 400l. a year, cultivated by the proprietor, a race of yeomen, not gentlemen, and every appearance of building, culture, &c. are admirable. But when such owners attempt to live like gentlemen, the contrary is sure to be found; for their expenses take an improper turn, their farms are neglected, and the owners ruined.

## ESSAY XXVIII.

*On Live Stock.*

THE great obstacle to the *improvement* of domestic animals, seems to have arisen from a common and prevailing idea amongst breeders, that no bull should be used in the same stock more than three years, and no tup more than two; because (say they,) if used longer, the breed will be *too near a-kin*, and the produce will be *tender, diminutive, and liable to disorders*; some have imbibed the prejudice so far as to think it *irreligious*; and if they were, by chance, in possession of the best breed in the island, would by no means put a male and a female together that had the same sire, or were out of the same dam.

But, fortunately for the public, there have been men, in different lines of breeding, whose enlarged minds were not to be bound by vulgar prejudice, or long-established modes, and who have proved, by many years experience, that such notions are without any foundation.

Mr. Bakewell has not had a cross (from any other breed than his own) for upwards of twenty years. His best stock has been bred by the nearest affinities, yet they have not decreased in size, neither are they less hardy, or more liable to disorders ; but, on the contrary, have kept in a progressive state of improvement.

This mode has also been frequently practised in breeding the best dogs and game-cocks. A certain gentleman, who produced the best pointers in the north of England for many years, never bred from any other than his own ; because, he said, he could not find better to cross them with. And I am informed, from good authority, that a breeder of game-cocks, who was very successful, would never allow his breed to be contaminated by crossing with others ; and to this precaution he attributed all his superiority.

But one of the most conclusive arguments that crossing with different stock is not necessary to secure size, hardness, &c. is the breed of wild cattle in Chillingham-Park, in the county of Northumberland. It is well known these cattle have been confined in

this park for several hundred years, without any intermixture, and are perhaps the *purest breed* of cattle of any in the kingdom. From their situation and uncontrouled state, they must indisputably have bred from the nearest affinities in every possible degree; yet we find these cattle exceedingly hardy, healthy, and well-formed, and their size, as well as colour, and many other particulars and peculiarities, the same as they were five hundred years since.

From these instances, it appears there can be no *danger* in breeding by the nearest affinities, provided they are possessed, in a *superior degree*, of the qualities we wish to acquire; but if not possessed of these, then we ought to procure such of the same kind as have, in the most eminent degree, the valuable properties we think our own deficient in. It is certainly from the *best males and females* that *best breeds* can be obtained or preserved; to breed in this manner is undoubtedly right, so long as *better males* can be met with, not only amongst our neighbours but also amongst the most *improved breeds* in any part of the island, or from any part of the world, provided the expense does not exceed the proposed

advantage. And when you can no longer, at home or abroad, find *better males* than your own, then, by all means, breed from them, whether horses, neat cattle, sheep, &c. for the same rule holds good through every species of domestic animals. But, upon no account, attempt to breed or cross from *worse* than your own; for that would be acting in contradiction to common sense, experience, and that well-established rule—“ *That best can only beget best;*” or, which is a particular case of a more general rule, viz. that “ *Like begets like.*”

### *Feeling.*

A nice or good judge of cattle and sheep, with a slight touch of the fingers upon the fattening points of the animal, viz.—the hips, rumps, ribs, flank, breast, twist, shoulder-score, &c. will know immediately whether it will make fat or not, and in which part it will be fattest. I have often wished to convey in language that idea or sensation we acquire by the touch, or feel of our fingers, which enables us to form a judgment when we are handling an animal intended to be fattened, but I have as often found myself unequal to fulfil that wish. It is very easy to know where an animal is fattest which is already made fat, because

we can evidently feel a substance or quantity of fat upon all those parts which are denominated the fatting points ; but the difficulty is, to explain how we know or distinguish animals in a lean state, which will make fat, and which will not, or rather which will make fat in such and such points or parts, and not in others ; which a person of judgment (*in practice*) can tell, as it were instantaneously : I say *in practice* ; because I believe, that the best judges *out of practice* are not able to judge with precision, at least I am not. We say this beast *touches* nicely upon its ribs, hips, &c. &c. because we find a mellow, pleasant feel in those parts : but we do not say soft ; because there are some of this same sort of animals which have a soft loose handle, of which we do not approve, because, though soft and loose, have not that mellow feel above-mentioned : for though they both handle loose and soft, yet we know that the one will make fat, and that the other will not ; and in this lies the difficulty of the explanation : we clearly find a particular kindliness, or pleasantness, in the feel of the one, much superior to the other, by which we immediately conclude, that this will make fat, and the other not so fat ; and in this a person of judgment, and *in*

*practice*, is very seldom mistaken. I shall only make one more remark, which is, that though the one animal will make remarkably fat, and the other will scarcely improve at all, with the same keeping ; yet between these extremes are numberless gradations, which the complete judge can distinguish with wonderful precision.

*The Galloway Breed, or Polled Cattle,*

Are a very valuable breed, and seem to be in weight and size, as much less than the long-horns, as these are than the short-horns ; they generally weigh from 40 to 60 stone, some particular ones reach 70 and upwards ; but their most essential difference from every other breed of cattle is, in having no horns at all ; some few, indeed, (in every other respect polled) have two little unmeaning horns, from two to four inches long, hanging down loose from the same parts that other cattle's horns grow, and are joined to the head by a little loose skin or flesh. In most other respects (except in wanting horns) these cattle resemble the long-horns, both in colour and shape, only they are shorter in their form, which, probably, makes them weigh less.

Their hides seem to be in a medium between the two last-mentioned breeds, not so thick as the long-horns, nor so thin as the short-horns ; but, like the best feeding kind of long-horns, they lay their fat upon the most valuable parts, and their beef is well marbled, or mixed with fat.

We find a few of this breed straggling through different parts of England ; among the rest, I remember the Earl of Darlington had a very handsome variety of them, finely globed with red and white. But we must look for the original of these in Galloway, (a large district in the south-west of Scotland) where they are mostly bred upon the moors or hilly country, and grazed upon the lands nearer the sea, until rising four or five years old, when the graziers and drovers take them up in great numbers to the fairs in Norfolk and Suffolk, previous to the turnip-feeding season, from whence the greatest part are again removed in winter and spring, (when fat) to supply the amazing consumption of the capital, where they are readily sold, and at high prices ; for few or no cattle sell so high in Smithfield market, they being such nice cutters up, owing to laying the fat upon the

most valuable parts ; a great excellence in all feeding cattle. It is no uncommon thing, in this refined market, to see one of these little bullocks outsell a coarse Lincolnshire ox, though the latter be heavier by several stones\*.

I have been informed, from good authority, that the polled cows are very good milkers, in *proportion to their size*, and the milk of a rich quality, yielding much more butter from a given quantity of milk than the short-horns ; and also, that the oxen and spayed heifers answer well for the draught, which certainly adds to the value of this excellent breed.

In Galloway they spay more heifers than perhaps in all the island besides ; and in this too their method is different from any other part I am acquainted with, for they do not castrate them until they are about a year old ; whereas in every other place, I know the

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\* I was told by a Lincolnshire grazier, that a Lincolnshire bullock and a Galloway bullock, sent from the same village to Smithfield at the same time, were sold for the same money, though the Scot was only half the other's weight.

heifer calves are spayed from one to three months old ; and it is now generally admitted, as the safest practice, to castrate calves and lambs, male or female, while very young.

Their manner of rearing calves is still more singular : the calves, from the time they are dropped till able to support themselves, are allowed to run with their dams, but are prevented from sucking, by means of a small piece of leather, with sharp spikes of iron fixed upon the outside, tied upon the upper part of the calf's nose, which, by pricking the cow every time the calf attempts to suck, prevents her from letting it, until the milk-maid comes, when she takes off the muzzle from the little animal's nose, and while she strips two of the teats, the calf takes care to empty the other two ; as soon as the maid has done, she fixes on the instrument again, ~~but~~ it is done in such a manner as not to hinder the calf from feeding upon the grass, though it is not allowed to taste the milk until the girl returns to her milking. In some parts of Scotland the general practice is, to milk three times a day in summer ; but I do not recollect whether this is done in Galloway.

Though the generality of their cattle are polled, yet they have several with horns, which they say are a *bastard* or *mongrel* breed, by crossing with long-horned bulls from Westmoreland and Cumberland. They prefer the polled ones, and of these the black or dark-brindled ones, to any other; and all allow them to be the original breed of the country.

The breeders in Galloway complain of their old breed being lost, or at least much worn out; but admitting their breed of cattle in some degree injured, yet there is little doubt, not only of its being recovered, but still more improved, when such a leading Nobleman as Lord Selkirk is among the breeders. Mr. Murray, of Broughton, and Mr. Heron, of Kirvochtree, have been long eminent in the breeding of Galloway cattle. Mr. Craik, Mr. Ditzell, and several others, have tried a cross from Mr. Bakewell's bulls; how far this has succeeded, I have not been able to learn: indeed I do not see how they can form a judgment themselves without a full trial. But I found that the generality of the breeders were against crossing with Mr. Bakewell's or any other kind of cattle; believing that their real

original polled breed, had already been injured by crossing with different kinds.

*Short-horned and Long-horned Breeds, compared.*

We have already observed, that the long-horns excel in the thickness and firm texture of the hide, in the length and closeness of the hair, in their beef being finer grained and more mixed and marbled than that of the short-horns, in weighing more in proportion to their size, and in giving richer milk; but they are inferior to the short-horns, in giving a less quantity of milk, in weighing less upon the whole, in affording less tallow when killed, in being generally slower feeders, and in being coarser made, and more leatherly or bullish in the under side of the neck. In few words, the long-horns excel in the hide, hair, and quality of the beef; the short-horns in the quantity of beef, tallow, and milk. Each breed have long had, and probably may have their particular advocates, but if I may hazard a conjecture, is it not probable that both kinds may have their particular advantages in different situations? Why may not the thick, firm hides, and long close-set hair of the one kind, be a protection and security against those impetuous winds and heavy rains to which

the west coast of this island is so subject; while the more regular seasons and mild climate upon the east coast, are more suitable to the constitutions of the short-horns?— When I say the long-horns exceed the short-horns in the quality of the beef, I mean, that preference is only due to the particular variety of long-horns taken notice of before, as selected, improved, and recommended by that attentive breeder, Mr. Bakewell; for as to the long-horned breed in common, I am inclined to think their beef rather inferior, than superior, to that of the generality of short-horns; and there is little doubt but a breed of short-horned cattle might be selected, *equal*, if not *superior*, to even that very kindly fleshed sort of Mr. Bakewell's; provided any able breeders, would pay as much attention to these, as Mr. Bakewell and his neighbours have done to the long-horns. But it has hitherto been the misfortune of the short-horned breeders to pursue the largest and biggest boned ones for the best, without considering that those are the best that pay the most money for a given quantity of food. However the ideas of our short-horned breeders being now more enlarged, and their minds more open to conviction, we may hope

in a few years to see great improvements made in that breed of cattle \*.

But notwithstanding these two breeds have hitherto been in possession of the best part of the island, yet I am inclined to think that the Galloway cattle, and even the Kyloes, might be bred with advantage, in many situations, so as to be more profitable than either the short-horns or the long-horns. I have a very high opinion of both these breeds of cattle, as true quick feeders, and being kindly fleshed, or excellent eating beef; which character they have established in the first market in the island.

#### *Drawing Oxen.*

I am sorry to observe, that there are not so many steers kept now as used to be formerly. Two reasons may be assigned for this; first, lands are now rented so high, that farmers cannot afford to keep steers to the age of oxen.

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\* I am glad to find my hopes have been well-founded; because, within a few years, a very rapid improvement has taken place in the breeding of short-horned cattle; so that in a few years I have reason to think they will surpass their rivals, the long-horns.

without working them ; which is the reason that fewer oxen are used in the draught now than formerly. A remedy for this complaint, perhaps, may not be so readily pointed out ; because, though a few people are convinced of the utility of drawing oxen in many cases, yet the generality of farmers will be very unwilling to be persuaded to this, because oxen are slower in their motion than horses, without adverting to the advantages attending the oxen in the feeding, shoeing, harness, &c. ; but above all, the conclusion (between an ox fatted for the shambles, after working three or four years, or indeed a lean ox sold to feed and a horse sold to the dog-kennel) is so exceeding striking, that I presume most people, when they reflect upon this very important matter, will agree to the drawing of oxen in every kind of work wherein they *suit* ; I use the expression *suit*, because I would not be understood to think, as some people do, that oxen will answer as well as horses in every kind of farming-work : but I apprehend that oxen will do several kinds of home work (such as ploughing, leading dung, corn, &c.) equally as well as horses. I advance this opinion on several years ex-

perience\*, and believe, that most farmers might use some oxen along with their horses, but would in general recommend the oxen and horses to be in separate draughts, because the difference of the step is so very unequal.

Much more might be said upon this important subject, but I will at present only add, that I heartily wish our legislature would take this matter into consideration, and give premiums to encourage the rearing and drawing of oxen, and also to promote the breeding of the best kinds of stock, as there is little doubt but it would have the most beneficial effects. It is true that many of our agricultural societies do give premiums for the above purposes; but these, though highly meritorious, are only partial, and confined to cer-

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\* My brother and myself, in partnership, at this time employ about 150 oxen in the draught, which is mentioned here as a proof that we approve of drawing oxen in many cases, after more than thirty years experience; we use them in carts singly, and two in a plough, with cords, without a driver, where they go equally as well as two horses, though not quite so swift; and I am happy to add, that the working of oxen is becoming more general every day, as many of our neighbours are following this example.

tain districts, while the influence of the other would be general and extensive.

*Great Milkers not quick Feeders.*

I apprehend, one great mistake that breeders in general have run into, especially in breeding neat cattle, has been, endeavouring to unite great milkers with quick feeders. I am inclined to think this cannot be done; for, wherever we attempt both, we are sure to get neither in any perfection: in proportion as we gain the one, in the same proportion we lose the other; the more milk, the less beef; and the more we pursue beef, the less milk we get. In truth, they seem to be two different varieties of the same kind, for very different uses; and if so, they ought most certainly to be differently pursued by those that employ them. If the dairy-man wants milk, let him pursue the milking tribe; let him have both bull and cows of the best and greatest milking-family he can find: on the contrary, he that wants feeding or grazing cattle, let him procure a bull and a cow of that sort which feeds the quickest, wherever they are to be found. By pursuing too many objects at once, we are apt to lose sight of the principal; and, by aiming at too much, we often

lose all. Let us only keep to distinct sorts, and we will obtain the prize in due time. I apprehend it has been much owing to the mixing of breeds and improper crossings, that kept us so long from distinguishing the most valuable kinds.

I do not suppose this doctrine to be so new, as it has been unattended to, and not properly considered ; for I have heard many people say, " How should that cow be a good milker ; she runs too much to flesh ? " And so it is, while all the great milkers are invariably thin. The former are generally high-sided, light-bellied, covered in all their fatting points, in proportion as they recede from the great milking-tribe, though kept on middling fare ; while the latter will be lean upon their backs, flat-sided, big-bellied, poor, and ill-looking, though much better kept than the others.

I own there is a middling kind of cows which give a tolerable quantity of milk, and also keep in pretty good condition ; but this, I apprehend, does not at all militate against the above reasoning, because, still those that incline the most to flesh, invariably give the

least milk, and *vice versa*: and though many of the middling cows will make very fat when they are dried, or the milk taken from them, yet will not get so quickly fat, nor so ripe, as those which give less milk, and are inclined more to fatten while in a milking state.

*The Dishley Breed of Sheep.*

They are peculiarly distinguished from other long-woollen breeds, by their fine lively eyes, clean heads, straight, broad, flat backs, round (barrel-like) bodies, very fine small bones, thin pelts, and inclination to make fat at an early age; this last property is most probably owing to the before-specified qualities; and which, from long experience and observation, there is reason to believe extends through every species of domestic animals. The Dishley breed is not only peculiar for its mutton being fat, but also for the fineness of the grain and superior flavour, above all other large long-woollen sheep, so as to fetch nearly as good a price, in many markets, as the mutton of the small, Highland, and short-woollen breeds.

The weight of the carcase, in general, is, ewes, three or four years old, from 18lb. to 26lb. per quarter; wethers, two years old,

20lb. to 30lb. The wool, upon an average, 8lb. a fleece; the length, from 6 inches to 14 inches; sold, in 1792, at 10d. per lb.

There are two reasons for killing the wethers at two years old: first, they leave the most profit; and, secondly, if kept longer, they get too fat for genteel tables. To people who are strangers to these sheep, this may appear rather problematical; the following facts may remove their doubts:—a three-year old wether, belonging to Mr. Culley, was killed at Alnwick, by Mr. James Bolton, the 2d of October, 1787, which measured seven inches and one-eighth of solid fat on the ribs, cut straight through without any slope, and his back, from head to tail, was like the fattest bacon. It is very common for two-year old wethers to cut four inches thick of fat on the ribs, and from two to three inches all down the back: even ewes of this kind, which have bred and suckled lambs till July, when killed about the Christmas following, will frequently measure four or five inches thick of fat on the sides, and two or three inches down the back, all the way from head to tail; and though this breed are not eminent for much tallow, yet ewes, under such circumstances, generally pro-

duce from 18 to 24lb. of tallow each. To weak appetites it is not so inviting as the leaner mutton, but it finds a ready market amongst the manufacturing and laborious part of the community, whom necessity has taught to lay out their money to the best advantage, and who have found, by experience, that a pound of bone is not so nutritive as a pound of mutton; and, of course, they always endeavour to buy that which has the least bone and most flesh\*.

The weight of wool clipped from these sheep is not so great as from some other long-woolled kinds; but the wool of this breed hath hitherto been only a secondary consideration; the *quantity* and *quality* of the mutton obtained at the *least expense of food*, was the great object of the first improver; this point gained, a new field opens to the experimental rural philosopher, to cover these good carcases with the most valuable fleeces.

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\* I am well informed, that when the laborious class find this mutton too fat, they cut off a part of the fattest, with which they make suet-dumplings or bread-paste with it for pies, &c. and not unfrequently make sea or boiled pies of the fattest parts.

This improved breed is making its way very rapidly into all parts of the kingdom, by the practice of hiring tups; the price of which, for the use of one season only, is astonishing; and to those who do not know with what eagerness this breed is sought after, (by all who have tried them,) may seem incredible; yet it is a fact, that Mr. Bakewell has let tups, for one season only, for four hundred guineas each, and taken in ewes to be tupped at ten guineas each, (eighty from two persons, and forty of his own,) makes the sum of twelve hundred guineas for one tup in one season: besides these, he lets several, every year, at two and three hundred guineas each.

Our mode of management of this breed is as follows: The ewes generally lamb in March, when we give them a few turnips to increase their milk; the latter end of June, or beginning of July, the lambs are weaned, and sent to middling pastures: the ewes are milked two or three times, to ease their udders; and such as are not meant to be continued for breeding, are culled out and put to clover. When this fails, they get turnips, and are sold about Christmas, very fat, to the butchers, the price from 34s. to 40s. per head.

The lambs, after being weaned, take the name of *hogs*; they are generally put to turnips at the beginning of November\*, and continue at them till the middle of April, or beginning of May, when the wether-hogs are put upon good pasture, or second year's clover. The second winter they have turnips, till the clover is sufficiently grown to receive them, which is generally about the middle of April. They are clipped about the middle of May, and generally all sold by the middle or end of June.—Morpeth is our best market; where the two-shear wethers have been sold, for the last three years, from 40s. to 50s. per head.

We generally reckon one-third of the ewes to have two lambs each; that is, every 60 ewes to have 80 lambs. They are put to the tup, so as to have lambs at two years old, and kept for breeding until three or four years old, except such as are of particular good forms, or have other valuable properties: these we keep as long as ever they will breed. Such as are defective in shape, suspected of being slow feeders, or other unprofitable qualities,

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\* As we find it prevents a disorder called the black-water.

we never put to the tup, or attempt to breed from them.

### *Lincolnshire Sheep.*

The average price of hogs, bought in at Lincoln and Boston fairs, is about 26s. per head; if these are kept until *three-shear*, the average weight of the wool will be about 12lb. a fleece; but when they breed their own stock, and have nearly an equal number of ewes, hogs, and wethers, the average weight of the fleece is about 9lb. Very few (if any) of the Lincolnshire breed, are ready for market at *two-shear*; and I am credibly informed, that several are under the necessity of wintering some of their *three-shears* before they are marketable. I am just returned from London, where I find the average price of *three-shear* marsh sheep not to exceed 35s. A friend, who buys a great number every Michaelmas of *three-shear* marsh sheep to put to turnips in the vicinity of Wakefield and Rotherham, assures me, that 35s. is the full average for picking the best lots; and an extensive sheep farmer near Boston informs me, his ewes that missed lamb last year, were sold in Smithfield (from August to Michaelmas) at about 21s. round, and that the highest price

he got for his three-shear wethers was 36s. and several lots sold under 30s.—His flock are considered of the best Lincolnshire breed.

Some of my neighbours, who have been in the habit of using rams of the Dishley breed, have, for the three last years, sold their two-shear sheep in May (clipped) for 42s. a head round; another sold 300 two-shear sheep at Michaelmas, in one lot, for 43s. a head, and left only 26 culls.—The average weight of the wool of this flock is 9lb. a fleece.

From these data a fair comparison may be made.

Pure Lincolnshire breed, sold at three shear,

	£. s. d.
Three fleeces of wool, 33lb. at 10d. per lb.	1 7 6
Sold at Michaelmas, three-shear, for . . .	1 15 6
	<hr/>
Divide by 3) 3 3 0	<hr/>
Gives the yearly profit	1 1 0

Crossed with the Dishley breed, sold at two-shear,

	£. s. d.
Two fleeces of wool, 18lb. at 10d. . . . .	0 15 0
Sold at Michaelmas, two-shear, for . . . .	2 3 0
	<hr/>
Divide by 2) 2 18 0	<hr/>
Gives the yearly profit	1 9 0

From the above statement, it appears there is a profit of 8s. a head in favour of the latter; and, supposing only three sheep to be depastured on an acre, the difference will be 11. 4s. an acre; but, on the rich marshes and best grazing grounds, the difference will be considerably more.

However, I am very glad to find, that the prejudices of the Lincolnshire breeders are now giving way to their better-informed reason, as many of the great tup-breeders in Lincolnshire are now hiring and buying rams from the midland counties; which is certainly the best, readiest, and only method to recover that valuable breed of sheep, (of which they were first in possession) and of which they, of any other county of Great Britain, can make the most advantage, from having the greatest quantity of rich sheep pasturage.

After what has been said, will it not appear very extraordinary, that not only the midland counties, but Yorkshire, Durham, and Northumberland, can send their long-woolled breed of sheep to market at two years old, fatter in general than Lincolnshire can at three? It is a matter of fact, however, and I have no doubt

of clearing it up to the satisfaction of my unprejudiced readers in a few words.

The rich fatting marshes in Lincolnshire are, beyond any other county I know in the island, best adapted to the growing and forcing of long heavy wool. This, with the high price that kind of wool had given, previous to the American war, very probably induced the sheep-breeders of that county to pursue it so ardently; in preference to every other requisite, that they neglected the form of the carcase and inclination to make readily fat; *essentials*, that the other sheep-breeding counties were under a necessity of attending to, otherwise they could not have got them made fat in proper time, from their land not being in general near so rich as the Lincolnshire marshes. In short, the Lincolnshire breeders, by running so much upon wool and large bones, had got their sheep like their black horses, two great ends, a long thin weak middle; and lost the thick firm barrel-like carcas, broad flat back, fine clean small bone, and inclination to make fat;—those distinguishing characteristics of the best sheep, and for which the Dishley breed is so eminently conspicuous.

*The Heath Breed*

Have large spiral horns, black faces, and black legs, a fierce wild-looking eye, and short firm carcasses, (weighing from 12lb. to 16lb. a quarter) covered with long, open, coarse, shagged wool; the fleeces weigh from 3lb. to 4lb. each, and sold in 1792 for 6d. per lb.

They are an exceedingly active and hardy race, run with amazing agility, and seem the best adapted of all others to high, exposed, *heathy*, mountainous districts. They are seldom fed until they are three, four; or five years old; at which age they feed well; the mutton is excellent, and gravy high flavoured.

This hardy wild-looking tribe are first met with in the north-west of Yorkshire, and are in possession of all that hilly or rather mountainous tract of country adjoining the Irish Sea, from Lancashire to Fort-William. Indeed their introduction into the Western Highlands of Scotland has been only of late years; nor is there the least doubt of their answering equally as well in the mountains of Argyleshire, as in those of Westmoreland and Cumberland; for it is well known, that the climate

is pretty much the same in all that rugged coast, having almost uninterrupted rains and strong winds. Indeed the Galloway and Ayrshire sheep are in some degree different; but I take them to be only a variation, probably from crosses between these and the Cheviot sheep. But, within these few years they have in those two counties been making some trials of that most useful kind of sheep, best known by the name of the Dishley breed; and every friend to his country will be glad to hear, that they have hitherto succeeded beyond expectation. Nor will any person, conversant with breeding sheep, be surprised at this; because they are in every respect as well or better calculated to thrive in the flat country and lower hills, as the black-faced ones are for the mountains.

As these sheep are so well adapted for lingy or heathy mountains, and cold exposed situations; what a pity they are not covered with a finer and more valuable fleece! There is no doubt but it might be improved; indeed it is scarce possible to make it coarser. Some trials from the Dishley breed have been made about Moffat, in Annandale, at the request of that patriotic nobleman, the Earl of Hope-

toun; but I am very sorry to hear, that notwithstanding the influence and earnest solicitations of his lordship, the breeders are so exceedingly averse to it, that they do, and say every thing they can, to lessen the merit of these trials, and, like all ignorant people, are quite prejudiced against every kind of sheep except their own.

The heath sheep have been tried in those remote parts to the North of the Murray-Firth, viz.—Ross-shire, Sutherland, and Caithness, and have answered very well. The Cheviot sheep have also found their way into those districts;—which of the two breeds will be found the most advantageous and best adapted for these northern regions, time and fair experiment will discover. There is little doubt but that either of them will be found better than the dun-faced kind, the only sheep known in the Highlands until of late years.

## *A D D R E S S.*

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HAVING now brought these Essays to a conclusion, I have nothing left but to express an anxious concern, lest I may have inserted papers that, in the opinion of well-informed persons, may be deemed unworthy of preservation. Some may think that I have attended too little to the Practical part of Agriculture; while others, who amuse themselves with the Theory of the Art, will be disposed to approve of what I have done. Of this matter my opinion is, that Theory and Practice ought to be blended together, as they do not admit of separation, the one being imperfect without the other. How far I have succeeded in my attempt, must be left to the decision of those for whom the work is constructed.

As this Selection contains many original Papers, I shall be happy to see them as generally diffused as possible; for which reason, I embrace the opportunity of freely offering them to the Editors of Agricultural Publications, in order to answer the liberal end of universal communication. In order to mark the progress of Agricultural Improvements, I have it in contemplation to publish two Volumes, annually, in the manner of this Selection; but, in the execution of the design, I shall be directed by the opinion that the public may entertain of the present Publication.

A. HUNTER.

YORK, *January 1, 1803.*

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ADVERTISEMENT.—Having had the satisfaction to see three Editions of this Work called for, during a period of twenty-four years, and as this will be the last to which I can expect to put my hand, I have only to express my warmest acknowledgments for the favourable reception that my endeavours have met with.

A. HUNTER.

YORK, January 1, 1803.











